Panel C-15

# Teaching Technical Writing to Minority Students: Perspectives for the 1980s

THE PROBLEMS INHERENT IN TEACHING TECHNICAL WRITING AND REPORT WRITING TO NATIVE AMERICANS

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SUMMARY

The Native American presents a unique problem to the college technical writing instructor for two reasons: English is likely to be the Native American's second language and mainstream American the second culture. The contrasts between native and acquired language and cultural systems result in a number of predictable difficulties. Error analysis indicates the same problems. Yet, the ideals of technical writing can be taught through compartmentalizing the task into minimal units and then teaching the related skills.

The Native American is a speaker of English as a second language, or the Native American is a speaker of English as a second dialect. In either case, the standard mainstream language is likely to have for the Native American at least some of the speaking and writing problems that any second language would have. For the Native American who is attempting to learn the particular skills of technical writing, the task is compounded. Because mainstream American culture is also a second, a learned, culture, the Native American's natural reactions to situations that require the specific skills that are related to a technical field are likely to bear cultural overtones of the first culture. As Paulston and Brude. have noted, (p. 58) although learning to speak a language is quite an accomplishment, "...it is easier to keep one's linguistic codes separate than one's social codes as one is often not aware of the social codes on a conscious level until they are violated. It is much easier to be bilingual than bicultural." The kind of judgment that technical writing requires is specialized; one does not learn it by becoming accustomed to the water.

That many (if not most) Native Americans are non-native speakers of English can be discerned in the five divisions of natural language: in phonological analysis we find that there are some sounds that are likely to be confused and that there is likely to be a variant of English that the tribe members share and that is recognized as a variety of the main language. In morphology we find that word choices are likely to be affected by age, first language, and experience. The English syntax of non-native English speaking Native Americans will probably show some aspects of the first language as manifested in word order, word form, tense, and world view. In the realm of meaning, we find evidence of a different world, different connotations about what seem to be common concepts. In the study of kinesics, we find an entirely different set of rules.

According to the theory of language-culture relativity as put forth by Benjamin Lee Whorf and Edward Sapir, language shapes the universe for its speakers, language determines Weltanschauung, that a person understands the world by selecting--in accordance with the cultural constraints of his or her language, those concepts that the language (i.e. the language community) has deemed relevant to human experience, and that only a small percentage of everything in any particular vista is relevant.

The concept is clear in an example: What is a river? To a boatman, it is a road. To a foot-traveler, it is a challenge to cross. To a hydrologist or a farmer, it is a source of water for different puroses. To a hydroelectrical engineer, it is a source of power. To a fish, it is home. Another example: What is the Painted Desert? To an artist, it is color, shapes, feelings. To a photographer it is light, reflections, and relationships as well. To a Navajo, it is grazing land. It is good to remember that the theory of language-culture relativity was formed after the studying of American Indian languages had begun, and that languages that manifested such great cultural differences had not been met and analyzed in such a great number before that time. The languages of Europe and Asia were relevant to different worlds; the differences were not likely to be so great, and the contrasts were not so remarkable as to cause anthropologists to take special note and make the inferences.

This special role of culture in the perceptions of non-native speakers of English brings to focus the entire [illegible]ition of composition teaching. The basis for compostition has long been a [illegible]ure base: all the members of a class read a work of literature--someth[illegible]evant to their age group and well written so that they have a common situati[illegible] piece of human experience, to discuss. Then the teacher can use the literature to build a meaningful program, one that will exercise analytical skills and critical thought. It is true that there are some stories that will be appropriate for the mixed backgrounds of a second language class, even for the Native American class, but much more experience with European tradition is essential for European literature to be understood. Of course, technical writing has a different focus, perhaps one that is more important to the Native American; its involvement is not with interpretation at all, but with single purposeness. Perhaps technical writing is a more easily acquired skill, a more logical place to begin teaching second language learners to write in English.

When Merlin the Magician in T. H. White's book, The Once and Future King, helped young Arthur understand his universe, he changed him into a bird and a fish. Do we require Native Americans to turn into European Americans to understand some of the literature that is typically taught in freshman English courses? How much of what we are expecting these students to understand is really foreign to them? And how much of the logic in the development of the story is comprehensible? Even "creative" language, literature, has development patterns that probably do not match those of their first languages; and how much of what the words mean to them can we understand? For example, is there any way that we could read Shirley Jackson's The Lottery with the same cultural experience as a person from a high ritual society? Or, if we are looking at Hamlet through Yaqui, Laguna, or Papago eyes, do we see the same drama? We must remember that in the late 1930's, German audiences cheered Kreon as a stong leader, one who put the disrespectful upstart Antigone in her place--hardly the interpretation that most English readers have ascribed to--and not what we think Sophocles meant (or did he?) It's how the reader looks at it and which cultural lenses are used.

Evidence shows that requiring language and cultural displacement before any composition can take place at least doubles the second language learner's task. Robert B. Kaplan, in his classic article on rhetorical patterns in other languages, (Language Learning, "Cultural Thought Patterns in Inter-Cultural Education," 1966, 16:1 & 2, pp. 1-20) presented convincing findings about the thought patterns of some other languages and opened the field of rhetorical pattern research. In the fifteen years since Kaplan's article, there has been corroborating evidence, but little if any counter-evidence.

For this writer, the understanding of what Kaplan was discussing came slowly. While in Turkey as a Peace Corps Volunteer, I had learned to speak Turkish fairly well although I could not seem to write successfully in Turkish. My tutor said that my writing was correct, cold, and lifeless. Simultaneously, I was grading the papers of my Turkish students as flowery, overstated, and pretentious. It took a while for the obvious to occur: that Turkish rhetoric required more embellishment than English, that the rhetorics of the two languages were quite different! Kaplan's extrapolations of thought patterns are idealized forms that reflect the logic systems of languages. Because Kaplan was able to see certain patterns emerging from the analysis of some six hundred students' papers, he was able to chart the results. He showed that Semitic language speakers tend to use parallel structures in coordinations, applying these structures in such a way as to appear as elements of equal value in English composition. Kaplan infers that the Semitic languages, therefore, contain a flexibility that can accomodate parallel constructions in a way that English does not. The use (overuse) of these parallelisms strikes the American English reader as strange and somewhat immature. To American English readers, the relationships of ideas are likely to come from the following set:

1) Chronological (narrative or process)
2) General idea to specific example
3) Result to reason for it
4) Thesis statement to definition of terms
5) Concept to description
6) Comparison of ideas
7) General whole to parts
8) Idea to its analysis

Furthermore, the American English reader will not tolerate another pattern, certainly not parallels. Conversely, a Semitic speaker finds the American idea of parallel constructions strange: parallel lines by definition can never meet; therefore, such ideas need careful and artful coordination to bring out the power in their similarities. (Personal communication with Hasan Ali Abbas, 1981)

English expository writing is ideally linear: the topic sentence + support. The highest marks are given to that piece of writing that most clearly sets forth the main idea, most crisply outlines the supporting information, and most succinctly puts the whole thing together. In this way, if in no other, the cultural value of direct linear development is seen. Other cultural values, such as "getting to the point" and "not beating around the bush" are also obvious, even though they are exactly contrary to the rhetorical patterns of some other languages. Chinese, for example, tends to use a circular development, one which intentionally beats around the bush. To speakers of some Oriental languages, it is uncultured to go straight to the point--it is rather like telling the punch line of a joke first. The preferred pattern spirals inward as important notes are picked up along the way to the main idea. Each idea is related to the one before it and to the one after it. Each sentence adds a new piece of information that brings the topic and the topic sentence into the open.

Although the thought patterns of Romance languages are generally closer to that of English (is this perhaps why we think that it is easier for the Spanish speaker to learn English, or at least one of the reasons?), Romance languages allow much greater digression than does American English. French prose, for example, uses many flourishes of prose to give substance to the expression, and in Spain the "perfect" American English paragraph "has nothing interesting to keep the reader reading." (Personal communication, Jesus Carrera, 1981.)

Kaplan's research also uncovered some truths about Russian rhetoric; the patterns allow for many parenthetical amplifications that, when expressed in English, make for very complex structure.

In contrast, we have the basic agreement in American English that paragraphs ought to be straightforward and concise, that a paragraph ought to be a logical division of material and not simply a typographical one, and that deadwood and extraneous ideas should be cut out. By implication, we have a number of languages and therefore almost assuredly different basic organization principles--ones that are likely to be greatly different from American English, if we believe that language shapes one's view of the world. How then can we presume to teach the Native American to write in English; how can we teach composition with a literature base; and how can we teach technical writing?

The first task is to extrapolate the thought patterns of Native Americans. The task is great, but already there are clues. Mary Jane Cook (Turner, pp. 241-250, 1973) pointed out that at the sentence or T-unit levels, there is a commonality in the kind of errors that Southwestern Native Americans make, mistakes that show some but not definite language family lines. Cook's research suggests the appropriateness of an error analysis approach.

Hans Guillermo Bartelt (1980) uses this observation from Cook and the concept of interlanguage as defined by Selinker (1972) in his postulation that Navajo-English and Western Apache-English speakers tend to manipulate the tenses of English to express what would be the relevant modes and aspects of the mother tongues: the usitative and imperfective modes and the continuous aspect for the present tense in English, and the progressive, optative, and iterative modes and repetitive aspect as associated with the progressive aspect, and the perfective mode as associated with the past tense in English.

The problem of extracting the thought patterns and errors that are characteristic of Native Americans is compounded by the fact that all of the students are using an interlanguage and that they are <u>trying</u> to write using models--at the very least models through the directions of the teacher. Therefore, it is difficult to find many clear examples of thought patterns and to generalize from them. Yet, several patterns do appear when writing samples are analyzed, and from these general patterns, through extrapolations, conjectures, and speculations, some implications for teaching expository and technical writing can be made.

The methodology for determining an error in rhetoric, as the first step in remediation includes three processes of analysis: contrastive analysis of rhetoric (some things sound flowery in one language but not in another, what is good prose in one language is cold and lifeless in another), error analysis (the student is doing something wrong, what is it?), or the application of principles ("This is what a well-written English paragraph looks like: here are the principles--apply them and you'll learn to write well.") The composition teacher may use one, two, or all three processes in understanding the second language or second dialect speaker's writing problems; the next step is the development of corrective procedures.

Analysis of Native American writing shows a number of rhetorical problems and suggests some Kaplanesque patterns of thought organization. The major problems are logic of arrangement, selection of support, and time and space. Let us consider each of this matters.

EXAMPLE: Logic of Arrangement
The symbolic representation of one group of Southwestern Native American papers is a completed circle, starting at a logical point--such as the beginning of a day, and completing the whole day. Specific examples include a stude t's report on what it was like to go to a boarding school; the paper began wit the sun rising in the morning and ended with nightfall. Another student described his sandals from the moment of purchase, through years of wear, to the need for a new pair. In this arrangement of ideas, the details and support statements are such that a whole is related to the audience by means of a person's reactions to it. A Navajo student described a rodeo in terms of his own personal reactions and experience with each aspect, thereby suggesting that once the circle is completed, like a bicycle wheel's spokes, the details and supports converge on the center, the writer. Another student reported on a movie in terms of what he had experienced; the chronology, therefore, was more of a descriptive sequence of emotions than a narrative.

In all the cases cited above (and in the other compositions that suggested this configuration) there was a focus and limitation problem for the American English audience because of the description of what seems to be a whole gestalt. (In other words, support was included that the native speaking reader found to be extraneous.) At the same time, it is difficult for the English-speaking mind to understand whether the focus is the rodeo or the cowboy's experience; so much is this a problem for the English-speaking writer that the two concepts (the story and the reaction) would most likely form separate paragraphs.

EXAMPLE: Selection of Support and Scope of Detail
Again the pictoral form seems to be that of a circle with the topic idea in the middle and lines from facts going in toward the center--although some of the spokes of the bicycle wheel appear broken off. One clear example is one in which the student wanted to write about the usefulness of the quarter horse to the cowboy. A native speaker of English would probably have analyzed the positive aspects of the quarter horse or compared and contrasted the aspects of the quarter horse with other horses. Instead, this Papago student discussed all horses, intertwining the concepts of quarter horse superiority in such a way that the audience never got the straight message that the best horse for a cowboy is a quarter horse. It was left to the audience to do the inferring. The selection of detail was so

broad that the thesis was lost. Similar problems have been noted in many other papers; too often every detail (or so it seems to the English reader) is included.

EXAMPLE: Time and Space

The symbolic pattern suggested in the Native American problem with time and space is that of concentric circles. The most obvious example is the Hopi sense of time and space. The Hopi's concepts of time and space are radically different from the English speaker's; Hopi has no time and speed words as English does. In English, a person stands on a time line: I was there, now I am here, and that is where I am going. In Hopi, I am here in a time and space; all that was is part of this reality and the potential for all that will be is also here. Distance is time and space away from the center of my cognition, that which is me, here, now.

It is not surprising, therefore, to find that one common Hopi thought pattern is concentric circles, or telescoping. One short example that can be quoted here shows this pattern:

> People all over the word have individual lifestyles that are distinctive. Societies as well as individuals have their differences. The Hopi culture has a unique culture to which no other culture is similar to.

This same student did exactly the same thing in a much longer composition about the components of a culture--language, religion, and traditions.

What are the implications for expository and technical writing? The first imlication is that the concepts of the audience, the message, and purpose are all subject to cultural interpretation. Also, some specific problems are brought into focus.

1. The Concept of Promptness Native American time is flexible, natural.
2. The Contextualization of Purpose Expository writing in general and technical writing in particular are based on principles of persuasion and involvement of audience that are sometimes problems for Native Americans. The problem of ethics is a convincing example. The Native American asks whether it is ethical to try to persuade another, to change his mind when he has already decided for himself what he wants to do. Another example is whether a person can look into the future. How specific can one be in writing a grant proposal? How much must be planned? What information will the receiving agency see as relevant? Is that what the Native American will see as importatnt? Is justification for items in a proposal necessary? If so, how much?
3. Interpersonal Relationships Good technical writing (contrary to most other kinds of formal writing) involves "you." The Native American is often not very comfortable with this purposeful drawing in of another person.
4. Wordiness "Some English is good; more must be better." If an expression worked once, it must be good enough to use again and again. The repetition of certain transition forms, so typical of Southwestern Indian writing, suggests that coherence of argument in their native thought patterns might require such repeating of forms.

5. Mixture of Registers A typical problem of Native Americans' English is a combination of language tones that do not fit together. Usually because of a lack of experience with English, they have difficulty in "feeling" which word or phrase matches the needs of a formal or informal situation.
6. The Problem of Abstracting What is culturally defined as the "main" idea by the speaker of one language might not be the most important one to a person from another culture. In a similar way, what one person judges as relevant is determined by his or her culture. The topic or problem of the paper or other writing assignment might be defined differently although the same words are used (in English) to describe the task because the cultures from which the rerceivers come will in a large part affect how the assignment is received.

For Native American students who are having writing and perception problems because of the kind of thinking/writing problems that are listed above, it might be necessary to use one or more of the following inductive procedures:

1. Topic choosing and limitation. It might be necessary to lead a student to awareness of appropriate topics and appropriate size of topic through exercises which require the student to estimate how much support would be appropriate for three to five topic statements (on the same subject). The students might also be asked to arrange a similar number of topics in order, most general to most specific. Next the student might be asked to double the scope of one subject and and then halve the same subject.

2. Support and detail relevance. Again, the teacher prepares a list of details to support the subject; one of the list is announced to be irrelevant. When the student gains facility in finding the non-related support ideas, the teacher contextualizes the "correct" support ideas and a few irrelevant ones by putting them in a paragraph and then by adding a completely unrelated paragraph to a well-written article for the student to sort out. By this stage, the student might be ready to select facts (from a list of related facts) to write an outline of ideas for a paper.

3. The contextualization process. Students often do not know all the information that they need to know in order to do an assignment; the inductive approach is to supply them with all the information that they need, the formula for putting it into an acceptable form, a model of a similar assignment, and (perhaps also) a list of how they can go wrong in completing the assignment.

4. Defining the purpose. To help students understand what the purpose of the writing assignment is, the teacher can provide the background, supply the rationale, and indicate the appropriate types of support. A teacher might give the students a list of audiences (and give each member of the class a different one) and a list of purposes (with each one in the class attempting a different one). Then the students' papers can

be analyzed as a class exercise, to determine what adjustments were necessary for the different purposes and audiences.

In other words, the methodologies for teaching technical writing are defined by compartmentalizing the skills in such a way as to reduce the components to minimal units. Thereby, the teacher provides a safe, controlled writing situation which will encourage rather than discourage Native Americans (and most other non-native speakers) to write clearly and concisely in the American English thought pattern.

Sheridan Baker in The Practical Stylist says, "If your writing falls apart, it probably has no primary idea to hold it together." Consider as a rebuttal that the falling apart is possibly in the eyes of the beholder, not the writer, because the primary idea is there--but not presented in a comprehensible way for the English speaker to understand more than the words.

## SAMPLE EXERCISES
### Memo Writing

[Note: This exercise focuses on evaluation of items, ordering, and appropriateness of language.]

What order is best for a memo? In the list below, there are all the necessary elements for a communication from an office manager to the staff members. The purpose for writing the memo is that there are a few problems that must be taken care of. You (as the office manager) also need to announce a meeting. First order the items by putting a number (1-8) in the blank that follows each concept. The write the memo in the space at the bottom of the page.

ADDRESSED TO ALL STAFF AT GOOD COUNSEL, UNLIMITED ________

THAT LIGHTS HAVE BEEN LEFT ON IN THE OFFICES ON THREE NIGHTS OUT OF THE PAST WEEK ________

TODAY'S DATE: June 30, 1981 ________

THAT NO ONE SIGNED OUT THREE BOOKS THAT ARE NOW BEING CONSIDERED STOLEN FROM THE LIBRARY ________

THAT COUNSELING ROOMS ARE NOT BEING KEPT AS ORDERLY AS MEMBERS HAD AGREED TO KEEP THEM ________

THAT SEVERAL MATTERS NEED TO BE BROUGHT TO THE ATTENTION OF ALL STAFF MEMBERS ________

THAT A STAFF MEETING WILL BE NECESSARY NEXT WEEK TO DISCUSS SOME BUILDING REPAIRS ________

THAT YOU ARE THE OFFICE MANAGER AND SIGN THE MEMO ________

THAT YOU NEED TO HAVE A PREFERRED DATE AND TIME FOR THE STAFF MEETING (Wed., 9:00am or Fri. 3:00pm) ________

Now write the memo.________________________________________________

## General to Specific

[Note: This exercises the students' abilities to select relevant support items, to find the most general and most specific items in a list, and to become more sensitive to the tone of the language.]

Which sentence is the most general? Would it be a good beginning sentence? If not, find the best general statement to introduce the topic.

Which sentence is the most important one? (Should you begin with this one? Why or why not?)

Which sentences do not contribute anything of value to the main idea?

Are any sentence irrelevant? Should they be left out?

* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *

AWP-750 is more expensive than IBM's comparable model. __________

AWP-750 sells for $11,999.46. __________

AWP-750 is Acme's new word processor. __________

AWP-750 comes in eight beautiful modern colors. __________

AWP-750 can be installed in two hours. __________

AWP-750 has many uses in the modern office. __________

AWP-750 is available in desk and console models. __________

AWP-750 is nearly as good as a computer. __________

AWP-750 saves the work of four secretaries. __________

AWP-750 is new on the market and has been tested for three months in busy offices. __________

Your assignment is to write a sales description of the AWP-750. Do any of these ideas seem valuable to you? Are any of them worded badly for your purposes? How could the negatively stated ones be improved? What would you leave out? Now write the description: ______________________________

## Finding Relevant Support Ideas

[Note: This exercise focuses on whether ideas that are related to the general subject are relevant enough—or closely related enough—to a thesis statement to be used in a paragraph as support.]

Which of the ideas presented here are relevant to the topic? Check all the ideas that support the numbered sentence. Be sure that you know why they are and why the others are not important enough to be included in writing to support the thesis statement.

1. The AWP-750 is an essential tool for a busy office.

how much work it can do in one day........................ ________
how many pieces of information it can hold................. ________
how much space it takes up compared to how much work it does ________
that a person can play games on the AWP-750................ ________
that it does the work of five secretaries.................. ________
that a good typist can make efficient use of the AWP-750 after only four hours of training......................... ________
that the AWP-750 comes in an attractive package............ ________

2. New Village needs a counseling program for many reasons.
The alcoholism rate is high. ............................ ________
There is no other counseling service in the village. ... ________
The other counseling services nearby are no good. ...... ________
New Village has a juvenile delinquency problem. ........ ________
There is a good building for a counseling center in the Park Community Center. ............................ ________
The village president's wife is an unemployed counselor. .. ________
The village has an unusally high divorce rate (35%). ... ________

## Formula for a Letter

[Note: This exercise gives rigid requirements to the student writer so that no part of the letter can become inflated with other than essential information.]

Assignment: To write a letter in the following pattern for information regarding requests for proposals.

<u>Paragraph 1</u> Introduction: Why are you writing to this office? (Maximum length, 5 lines)

<u>Paragraph 2</u> Support, type A: What project are you thinking of? (Use 6-10 lines to validate your reason for writing for information.)

<u>Paragraph 3</u> Support, type B: Who are you to ask for this information and to suggest this proposal? (Use 6-10 lines to summarize your position and reasons.)

<u>Paragraph 4</u> Conclusion: What can you say in terms of summary and polite formulas to end the letter appropriately? (Maximum, 3 sentences)

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INFORMANTS

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Panel C-20

Rhetorical Theory and Technical Communication: Some Inquiries

## A RHETORICIAN LOOKS AT TECHNICAL COMMUNICATION

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When I was first asked to teach technical writing, I experienced all the usual apprehensions of the typical English teacher. How could I get to know enough about a subject like nuclear physics to be able to make a judgment about the substance and the writing of a report on that subject? How could I learn all the special forms and formats of the kinds of writing done in technical fields? How could I sustain an interest in reading reports about subjects alien to my purview? Would all of my belletristic and humanistic instincts be anesthetized after a few weeks of immersion in pools of cold and colorless data? Would I be selling out to the "other culture" of the Two Cultures that C. P. Snow had once written about?

Like most English teachers who become teachers of technical writing, I soon learned that my apprehensions about these matters were unwarranted. The main problems that I and my students had were the same problems that attend any writing course: finding something to say and selecting, organizing, and verbalizing what the discovery process had yielded. I very soon learned that to be an effective teacher of technical writing, one had to become familiar with the kinds of writing demanded in various technical fields, to learn the conventional formats of that kind of writing, but above all, to acquire enough knowledge of the basic strategies of rhetoric to be able to guide students in composing not only the paper at hand but similar papers in the future. Although I am still very much of a neophyte at teaching technical writing, I want to talk abou' a knowledge of traditional rhetoric has helped me cope with what has to be the most cha'lenging and the most satisfying writing course that I have ever taught.

Of all the lessons that traditional rhetoric has to offer, the one that perhaps best orients the teacher to what Carolyn Miller has called "the community of technical writers" (ref. 1) is the lesson about the components of the communication process--the writer, the readers, the message, and the reality that the message is dealing with. Although many modern readers first encountered the so-called "communications triangle" in the work of such scholars as Roman Jakobson, M. H. Abrams, and James L. Kinneavy, the notion goes back as far as Chapter 3 of the First Book of the Rhetoric, where Aristotle said that a speech was the "joint result of three things--the speaker, his subject, and the person addressed."

What the teacher of technical writing nee's to do is determine how this kind of writing relates to the communications triangle. James Kinneavy can be very helpful to the teacher on this score, for he not only makes the communications triangle the central paradigm for his A Theory of Discourse but discriminates the various aims of discourse according to which component in the triangle receives the predominant emphasis. Elizabeth Harris has shown how she used the notions set forth in Kinneavy's A Theory of Discourse to structure her course in technical writing (ref. 2). That kind of discourse in which the writer discusses the objective reality which exists outside the writer and the readers Kinneavy calls Reference Discourse and subdivides that into Scientific Discourse, Informative Discourse, and Exploratory Discourse.

The new teacher of technical writing soon learns that the students' reports deal exclusively with phenomena existing in the "world out there." Although there may be elements of Persuasive Discourse and Expressive Discourse in the technical report, most of the writing done in a technical-writing class can definitely be classified as Reference Discourse. At one point, Kinneavy gives a simple formula for discriminating the three sub-categories of Reference Discourse: "Exploratory discourse fundamentally asks a question. Informative discourse answers it. Scientific discourse proves it" (ref. 3). Although there are instances of Exploratory Discourse, especially in the proposal stage, most of the writing done in a technical-writing class could be classified, in Kinneavy's terms, as either Scientific Discourse or Informative Discourse.

The rhetorical system of the classical Greeks and Romans would seem, at first blush, not be be of much help for the teaching of the scientific and informative varieties of reference discourse. I must concede that if we are going to get any help from traditional rhetoric for that kind of writing, we have to go to the kinds of logic and rhetoric texts that developed during the eighteenth century under the inspiration of such seminal thinkers as René Descartes, Francis Bacon, and John Locke. And indeed when we investigate the rhetoric texts of such men as Adam Smith, Hugh Blair, George Campbell, and even the fervently Aristotelian Richard Whately, we find a rhetorical system that is congenial with the empirical spirit of modern technology.

For one thing, reading such rhetoricians as Blair, Campbell, and Whately would certainly weaken your faith--if you had any--in the usefulness of the topics as a device to aid technical writers in discovering material pertinent to the development of the kinds of subjects they typically write about. One of the most notable changes that has taken place in the heuristic procedures for scientific and informative discourse is the shift of reliance on what Aristotle called "artistic proofs" to the "inartistic proofs"--that is, to the kind of data that exist in resources outside the writer. Modern science and many of the professions rely heavily on data supplied either by direct observation or by expert testimony. Modern science still has to deal occasionally with what is only "probably true," but today that probable truth is more likely to be supported by some kind of empirical evidence than by some kind of deductive argument.

Students in a technical-writing class usually do not need the aid of a heuristic system like the topics, because often the material of their reports is supplied by their firsthand inductive study of some problem. They frequently have so much data available that they do not know what to do with their embarrassment of riches. Their problem is not, as it often is in a Freshman English class, the problem of finding something to say on their subject but rather the problem of selecting and organizing the abundance of material that is available to them. Their problem is one of selection rather than one of discovery.

I have learned, however, that if the topics are presented not as sources of material that can be used in the development of a subject but as modes of thinking, they can be helpful to students in technical-writing courses and especially helpful to them with their problems of selecting and organizing the hodgepodge of data available to them. The topic of comparison, for instance, might suggest to students that some of the material available to them could be used to set up an illuminating analogy between what they are writing about and something that is very familiar to the audience. Or the topic of cause-and-effect could suggest that some of the available material could be used to expose the reasons for the particular problem they are dealing with. A systematic run-through of the other topics could suggest other lines of development, could indicate which items in the available material could be pertinent to a particular line of development, and could even designate where in the report a particular line of development would best fit.

Some of the students' decisions about organizing their papers are taken care of by the conventions that prevail about the number and the order of the parts in a formal report. But students can sometimes be helped in organizing their papers by being introduced to a pattern as ancient and mechanical as the six-part Ciceronian structure of a classical oration. In an article in College Composition and Communication, Andrea Lunsford pointed out that her students were "quick to discover the relation of the classical pattern to their own problem-solving reports: the introduction, statement of the problem and purpose, report of the findings, and recommendations and conclusions correlate nicely with the classical pattern" of exordium, narrative, partition, confirmation, refutation, and peroration (ref. 4).

One of the biggest surprises for me has been the extent to which considerations of style figure in technical writing. Ultimately, the question of the appropriate style becomes the major problem for most students. That the problem of style loomed so prominently surprised me because I had been under the impression that the style in technical writing was supposed to be as inconspicuous as possible. It is true that in this kind of writing, the prose style should be kept as unobtrusive as possible. But therein lies the rub. How to make the style unobtrusive presents the major problem for many students. A prose style marked by a heavy use of jargon and by strings of five or six noun modifiers of the main noun is hardly an inconspicuous style.

It was the plain style that the Royal Society recommended for scientific discourse during the seventeenth century, and the plain style is almost universally recommended by textbooks of technical writing today. But it is easier to make that recommendation than to follow it. How to convey information to readers about the highly abstruse subjects dealt with in technical reports is a frustrating challenge even for accomplished writers, but for students who do not command a copious vocabulary and syntactical versatility, the challenge can be downright crushing.

Until I began teaching technical writing, I always believed what Hugh

Blair had said in his famous eighteenth-century rhetoric text: that obscurity of style was due mainly to the writer's insecure grasp of the subject (Lecture X). But I have since come to doubt Blair's view, because I have now had enough experience with very bright students who had a firm grasp of their subject but still had difficulty expressing themselves simply and clearly. Consequently, I am convinced now that most of the time obscurity of expression in technical writing can be attributed to one or the other or a combination of two situations: (1) some subjects--usually those with a mathematical base--are so inherently abstruse that they cannot be readily and precisely rendered in language that an ordinary educated person can understand; (2) the writer does not yet have enough mastery of vocabulary and syntax to be able to translate what he or she knows into language that an ordinary educated person can understand.

Likewise, I no longer preach that figurative language is wholly inappropriate in technical writing. Schemes and tropes may not figure as prominently in technical writing as in a ceremonial oration or a piece of literary prose, but they can be serviceable and even unavoidable in technical writing too. In fact, sometimes it is an apt metaphor that enables the writer to make a difficult concept clear to the reader, and parallelism--to mention only one of the many schemes--is the inevitable structure when one is enumerating a series of coordinate items. If you have any doubts about the serviceability of figurative language in technical writing, I would urge you to spend some time counting the figures of speech in your students' papers--but be sure to count all the submerged metaphors in the text too.

Problems of style are closely related to two other components in the communications triangle: the writer and the readers. A confirmed rhetorician can hardly refrain from talking about those two components, even though those two elements are supposed to be kept in low profile in technical writing. It is true that there will not be many, if any, explicit references to the readers of the report and probably no use of the pronoun you, but writers of technical reports invariably get into trouble when they lose sight of their audience. They usually enjoy an advantage over authors of other kinds of expository discourse: most of the time, they have a clear image before them of at least some of the people who will read their report. Accordingly, they should be able to adjust their strategies to fit that perceived or conceived audience.

The text that has made us most conscious of the multiple and varied audiences for a technical report is J. C. Mathes and Dwight W. Stevenson's Designing Technical Reports: Writing for Audiences in Organizations (Indianapolis: Bobbs-Merrill, 1976). In Chapter 2 especially, the authors give us a clear picture of the range and level of readers who are likely to read a report even in an in-house circulation. Most of the decisions that the author makes in the composition of the report have to be made in relation to the heterogeneous complex of people who will read the report in whole or in part. Far from being an insignificant element in technical writing, audience is probably more of a determining factor in this kind of writing than in the kind of writing directed, say, to the nameless, faceless audience of a daily newspaper. The principal consequence of the fact that the report must communicate with a wide range of readers is that the author must strive to achieve a common-denominator style, relegating the highly technical parts of the report to the Appendix, which the experts can consult if they need to check on the accuracy of the data or the soundness of the research procedures.

Another commonplace about the technical report is that the voice and the personality of the writer should be suppressed. Besides being clear and unadorned, the style is supposed to be impersonal and nondescript. The pronoun I will be conspicuously absent from the prose, and the passive voice of the verb will be noticeable for its frequency. Because the report is supposed to be objective in its tone, authors are encouraged not be interject their opinions or their feelings.

There are sound reasons for the traditional insistence that the writer of a technical report maintain a low profile, but it would be a mistake to conclude that the ethos of the writer does not play a crucial role in technical writing. In technical writing, writers must exert their ethos much more skillfully and subtly than writers of other kinds of prose do. The encoder of the technical report must strike a delicate balance between rigorous anonymity and obtrusive personality, for some measure of ethos must be present in the document. The subtlest way for the writer to elicit the trust and confidence of the readers is to create the impression of being unremittingly truthful, judicious, accurate, precise, and diligent. The writer cannot just claim those virtues; the writer must exhibit those virtues in the way that he or she presents data or makes assertions or draws inferences. Although an image of the writer must come through to the readers, the technical report is not the place for a "loud" personality. The personalities of Richard Seltzer and Carl Sagan are probably too obtrusive in their writings; the personalities of Lewis Thomas and Jeremy Bernstein seem to strike the appropriate balance.

I have presented a view of technical writing from the perspective of a rhetorician. I need a good deal more experience at teaching technical writing than I now have before I can confidently advise others about how to teach the course well. But I have remarked to myself on a number of occasions how much better I taught this course right from the beginning than I taught the freshman composition course at the beginning of my teaching career. When I began teaching Freshman English, I had had no formal training in rhetoric, but by the time I taught my first technical-writing class, I was thoroughly steeped in the tradition of rhetoric. And, oh, the difference that acquaintance with the art of rhetoric made in my performance. Maybe a long stint of doing technical writing in the business or the professional world would be a better preparation for teaching the course than the one I had. But if one does not have the opportunity to serve that kind of apprenticeship, I cannot recommend a better alternative preparation than an immersion in the long and glorious history of rhetoric.

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SYNTAX, COMPREHENSION, AND BELIEVABILITY:

IMPLICATIONS FOR TECHNICAL WRITERS

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As a part-time teacher of freshman composition during my first year in graduate school, I received a paper from a young engineering student which has profoundly influenced my professional career over the interveening years. The paper was written on the topic of retrofitting homes for solar energy production--a subject which holds some interest to me. The paper, regardless of the timeliness of its subject and my interest in it, was dull; not middle-of-the-road freshman mediocrity, but magnificent blandness. Since the hour at which I was reading was late, I--wishing to give the student the benefit of a doubt--went to bed, resolved to read the paper fresh the next morning. Nothing changed; the paper was incontrovertably soporific. Since we writing teachers have no corpus of knowledge to fall back on in situations such as these, I became inspired. In this moment of inspiration, I decided to count the number of sentences in the student's paper and then the number of words per sentence. I wanted to see if some pattern was recurring throughout the essay. The paper had thirty-eight sentences; of these, thirty-six had eighteen words apiece; one had nineteen words, and the other had seventeen words. I was incredulous, astounded--positive I had made an important linguistic discovery. Here, I thought to myself, was a young man who thought in eighteen-word segments. When I confronted him with his accomplishment and asked him if he indeed thought in eighteen-word segments, and when he responded rather nonchalantly that indeed he did think in eighteen-word segments, I was elated, certain in my naivete that I would be famous. He went on to tell me that when he was in the eighth grade he had had an English teacher who, along with the typical admonitions not to begin sentences with <u>but</u>, <u>and</u>, or <u>because</u>, casually remarked one day that the average American-English sentence contained eighteen words. Interpreting the teacher's words as a righteous path to perfection, my student had dedicated his writing life to producing eighteen-word sentences, and he was good at it. This event convinced me that to some extent form could be separated from content in writing for the purposes of study. What I want to address today is some of the ways this is being done and some of the implications it has for technical writing and writers.

The results of a recently completed pilot study suggest certain trends in the effects which syntax has on reader comprehension. A series of close-recall tests was used to discover these trends. For the tests, an original selection of writing was rewritten in six different structural styles: right-branching or cumulative; left-branching or periodic; mid-branching using centrally embedded modifiers; inverted; passive voice; and parallel structure. Test subjects, college student volunteers between the ages of eighteen and twenty-two, were allowed five minutes to read one of the stylistic versions of the original or, as a control, the original itself. Following the reading, the subjects were given five minutes to answer questions based on the style they had read. The results of the analyses of the tests suggest trends which, upon further, more detailed research, should prove useful to the educator and the communication researcher alike. As an example, the results for the most part replicated the conclusions reported by Fodor, Bever, Kintsch, Keenan, and others in earlier psycholinguistic research; in other words, passive constructions tended to be more difficult to comprehend than active constructions, negations more difficult than non-negated constructions. However, interesting and potentially important extensions of earlier research were also suggested: cumulative styles appeared more difficult to comprehend than teachers of writing have been led to believe, while centrally embedded styles, though laborious to process, seemed in some instances to promote reader comprehension. The possible reasons for and effects of these observations will be discussed later in this paper.

In addition to the tests, questionnaires were circulated to writing teachers at five separate colleges; these questionnaires were designed to complement the tests--though in a subjective and evaluative way. I intended to discover opinions and nuances which might lead to future research on comprehension and believability. Insofar as the questionnaires suggested that teachers of writing tended to believe formal style (which can be associated with bureaucratese) much more readily than informal style, they succeeded in identifying areas of much needed research.

TEST RESULTS

The following three bar graphs show, respectively, the percent of correct answers out of the total number of questions, the percent of correct answers out of the number of questions answered by the subjects, and the percent of questions answered out of the total number of questions.

Table 1.

Mean Values for Percent Correct of Total Number of Questions

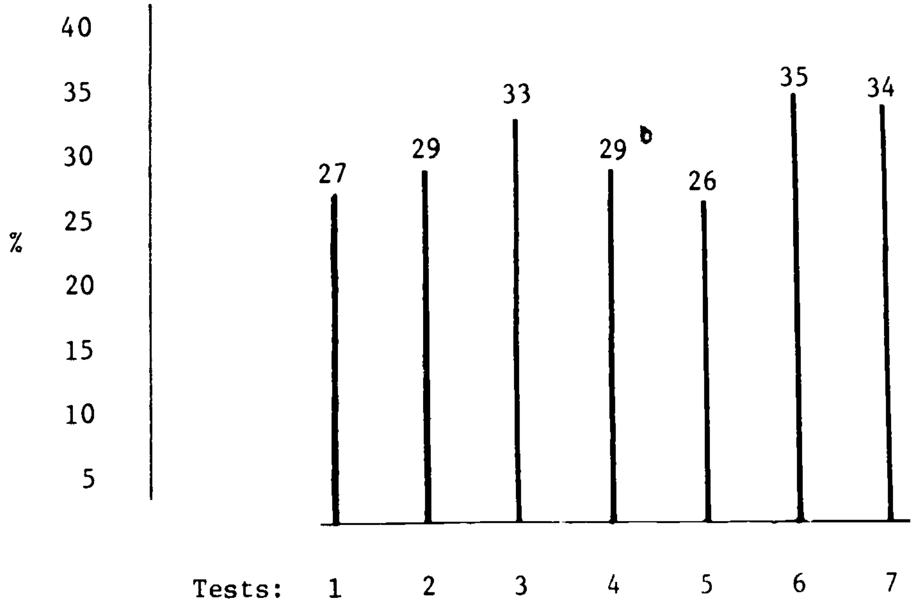



Table 2.

Mean Values for Percent Correct of Answered Questions

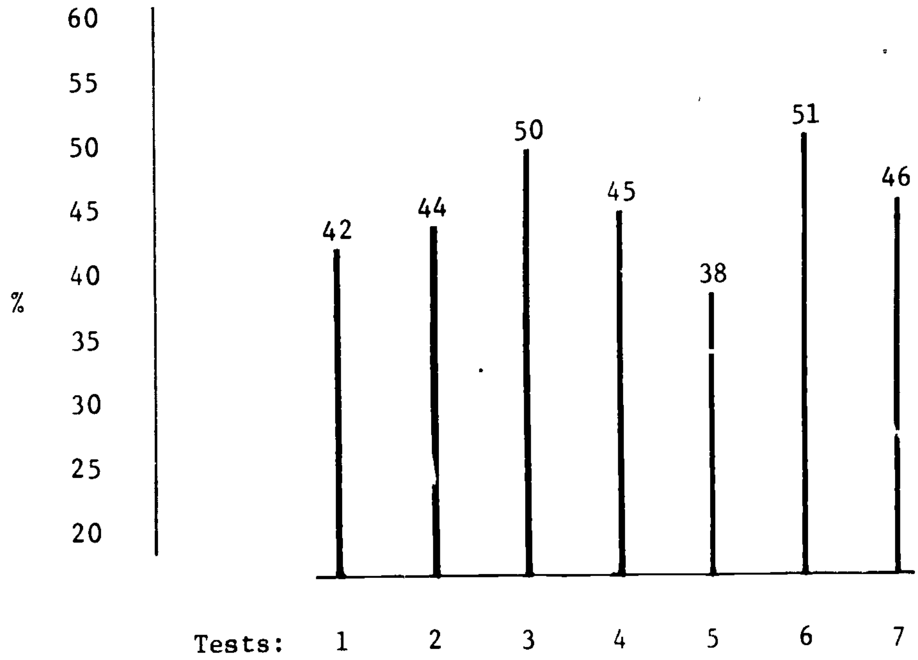
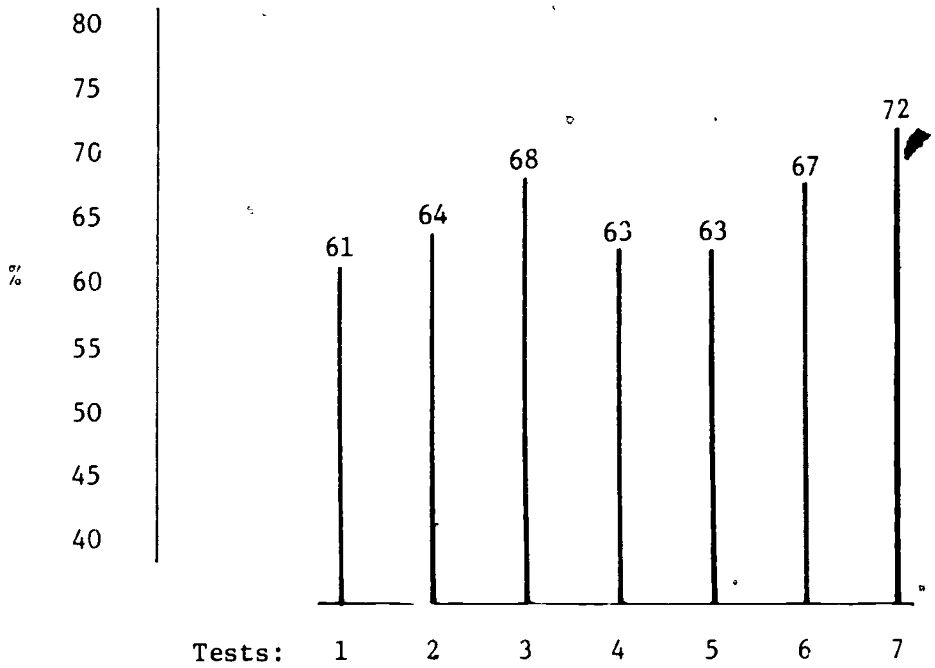


Table 3.

Mean Values for Percent Answered Out of Total Questions




In each of the tables, test 1 refers to right-branching style; test 2 to left-branching; test 3 to mid-branching; test 4 to passive voice; test 5 to inversions; test 6 to the original or the control; and test 7 to parallel structure. Two interesting results can be seen from the graphs. First, the version developed in a mid-branching, or centrally embedded, style proved to be surprisingly easy to comprehend--almost as easy as the control; whereas, all of the rest of the artificially developed styles were much more difficult to comprehend. This should come as a surprise to those of us who have been told that cumulative style, based on right-branching modifiers, is not only a clear and effective way to construct prose but also the American idiom. Since the testing procedure used for this research was not designed to determine the reasons for the results noted, we can only speculate until further study can be conducted to provide those answers. One possible reason that cumulative style did not enhance the comprehension of the test subjects is the fact that it is the American idiom; in other words, readers are so accustomed to this particular stylistic pattern that their attention to what they are reading is dulled. But why should a centrally embedded style, a style which is notably laborious to process, appear to enhance comprehension? One possible reason is that the style is not what the reader expects and, hence, the reader decreases his rate of processing the language and consequently his attention to what he is reading is increased. The second interesting result to be noted from this research is in Table 3, for test 7, parallel structure. More readers answered more questions for test 7 than for any other test. Interestingly, however, this increase in processing speed was not accompanied by an increase in the level of comprehension. One explanation for this could be that when reading a style which has been developed through the overuse of parallel structure, readers become stylistically conditioned to the syntactic structure of the discourse. Once a reader of parallel structure style becomes aware of the structure, he may be lulled into a lower attention to content. In other words, the rhythm of this particular style dulls a reader's senses. Future study may show that when a reader becomes conditioned to parallel structure, he may even tend to ignore the material placed in the latter positions within the structure--much as readers tend to ignore material placed within parentheses. At any rate, the research presented in this paper suggests that syntax does affect comprehension in complex ways. Specifying these effects will benefit composition and technical writing pedagogies.

QUESTIONNAIRE RESULTS

As I mentioned earlier, I intended, through the use of a questionnaire distributed to college teachers of writing, to discover writing biases--emotional and at times illogical responses which would shed some light on the state of writing education in our colleges. The results exceeded my hopes. Perhaps the best method of communicating the types of reactions to the various styles I used in the texts is to give an example of a particular style and some representative reactions to it.

Right-branching.

The search for intelligent life elsewhere in the universe is a timely and feasible undertaking with substantial potential secondary benefits which can be started now with only modest resources and can be expanded later to a much larger scale, if that turns out to be desirable and necessary.

Reactions.

"Unfortunately, this is believable because one expects scientific writing to look and sound like this."

"The writer seemed very objective because of his style."

The majority of the readers of this style felt that it was difficult, dull, and rambling; but they also admitted a tendency to believe what the writer had to say based on the style of the document.

Left-branching.

Needing only modest resources which can be expanded later to a much larger scale if that turns out to be desirable and necessary, the search for intelligent life elsewhere in the universe is a timely and feasible undertaking with substantial potential secondary benefits that can be started now.

Reactions.

"The writing sounds like the bureaucratese we expect in a scientific proposal. It avoids the suspicion of being trivial research by sounding like the typical, serious, and important research project."

One hundred percent of the respondents rated this style, which they classified as confusing and dull, as being moderately to strongly believable.

Mid-branching.

The search for intelligent life elsewhere in the universe is, with substantial potential secondary benefits that can be started now with only modest resources and can be expanded later to a much larger scale if that turns out to be desirable and necessary, a timely and feasible undertaking.

Reactions.

"The style gives the illusion of authority."

"The aggravation necessary to follow the train of thought greatly overwhelms the amount of information conveyed."

Not surprisingly, the respondents found this style to be difficult to process; they also had a tendency not to believe the author, one respondent going so far as to say that the writer seemed to be trying "to hide something."

Passive constructions.

The objective of the Science Workshops on Interstellar Communication are summarized by Morrison in his preface to the SETI report.

Reactions.

"The style is very formal, but for this topic it is suitable."

"The style is very convincing."

"The style sounds bureaucratic."

The respondents did not find a passive voice style as difficult to process as they did the three earlier styles; also there was some skepticism for believing the writer.

Inversions.

It is thought that the search for intelligent life elsewhere in the universe is a timely and feasible undertaking with substantial potential secondary benefits that can be started now with only modest resources and can be expanded later to a much larger scale if that turns out to be necessary and desirable.

Reactions.

"The style seemed proper."

"The writer uses the objective style of science and technical writing, but he does not achieve credibility."

"Though what the author has to say does not seem inane, the style he uses is a kind of scientific journalese: proper, measured, but without much vitality."

Inversions were disliked, but the style was not thought to be difficult to process. The respondents were much in the middle of the road as to whether they considered this style believable or not.

Parallel structure.

The search for intelligent life elsewhere in the universe is a timely and feasible undertaking with substantial potential secondary benefits. The search can be started now with only modest resources; it can be expanded later to a much larger scale if that turns out to be desirable and necessary.

Reactions.

"As a mover of jargon, the writer has skill and conviction."

"I like verve, grace, brevity, and forthrightness too much to read much of this sort of stuff--even for wages."

"Most scientists use this heavy, abstract, sometimes circuitous style in scientific discussion, which is why this writer seems authoritative."

"The phrasing seemed persuasive and sincere."

"Clear statements about potentially difficult issues."

To say that the style developed through an exaggerated use of parallel structure was more well received than any other style would be damning with faint praise. The respondents considered this version to be moderately easy to read and moderately clear. They suggested a strong sense of believability in the author.

GENERAL CONCLUSIONS

The respondents to the questionnaires point out an interesting paradox: the writing teachers tended to believe styles that they did not like and would not encourage their students to emulate as examples of good writing. With only a few exceptions, they did not point out the generally held conviction that bureaucratese can be and is being used to distort facts and withhold information. When we take these responses and compare them to the results of the tests, we see interesting and perplexing things. First, the tests suggested that a style which has been the vogue of writing education for some years may actually impede comprehension--for what reasons we cannot yet be sure. Second, many of the tested styles which appeared difficult to comprehend, and which the respondents concurred in the difficulty to process and understand them, the respondents nonetheless believed.

What implications do these results hold for us--teachers of technical communication? Their implications lie in their potential importance. If future research supports these findings, then we may have to reperceive our pedagogical stances on writing styles. Certain syntactic structures may prove to be advantageous vehicles for certain types of subject matter in particular writer/reader contexts, and the structures may not be what we have for years denoted as good writing.

TECHNICAL STYLE AND TECHNICAL WRITERS:

EXAMINING SOME ASSUMPTIONS

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The title of our session. "Rhetorical Theory and Technical Communication: Some Inquiries," indicates the trend toward re-integrating technical writing and other kinds of written communication. Teachers of technical writing must face the same kinds of problems all other teachers of writing face. Both Dr. Sides' paper, "Syntax to Comprehension: Implications for Technical Writing," and Dr. Corbett's paper, "A Rhetorician Looks at Technical Communication," address a central concern of instructors of technical writing: deciding what we should teach those writers who wish to communicate technical information in the most efficient and effective way. Each paper focuses on a different part of the communication process, but both work from the assumption that technical writing is one form of writing, not an entirely isolated kind of communication. Two basic questions come to mind after reading the papers. First, how do we as readers perceive and understand written technical communication? A consideration in answering this question is the relation of subject matter to style. Second, what kinds of information about writing should the beginning technical writer receive? Some determination about the most basic kinds of knowledge bout the writing process needed by the writer should be made. A convenient way to discuss these questions is to re-view the reader-writer-subject triangle from a different perspective. Rather than concentrating solely on the reader (the most important consideration in this type of writing), we should consider some effects of the subject matter and the writer on the writing, effects that are not usually given enough emphasis in textbooks or classrooms.

In his paper, Dr. Sides presents the results of a study to determine if certain syntactical structures enhance comprehensibility. After rewriting a passage using various sentence constructions--right-, left-, and mid-branching--he attempted to discover which type promoted the highest degree of retention. His findings, admittedly a first attempt, should help us move beyond depending on simplistic readability formulas to consideration of the many elements that aid or hinder comprehension of material by readers. Along with this emphasis on the effects of syntax on understanding, we should also develop a sophisticated model for audience analysis, giving more specific consideration to the necessity of using technical language depending on the nature of the audience and the subject matter.

The basis for a sound audience analysis should begin with Mathes' and Stevenson's model for in- and out-group communications in <u>Designing Technical</u>

Reports. This model directs the writer to first consider his or her place in the organization and the function of the report in the organization. The writer then designs the report according to the effects desired. Thus, the subject matter seems to be only a mass of material ready to be shaped in whatever way the writer chooses. But Sides' paper seems to indicate that sentence syntax (and ultimately other elements of style) has a much greater effect on retention and comprehension than any technical writing textbook indicates. If syntax has such a large effect on readers, then we should be more discerning and careful about teaching style to our students. As writers, they should be aware of the impact that their style can have on their readers. And they should also be aware that subject matter can dictate something about the style of presentation.

Discussions of style have focused, as Dr. Corbett indicates, on attaining a "plain style" with an implicit author whose attributes are accuracy, precision, and diligence. The subject matter is rarely considered as a factor in determining an effective style. Dr. Corbett also refers to Kinneavy's model for "reference" discourse with its three sub-categories: exploratory, informative, and scientific. These categories indicate something of the diversity of purpose in technical writing--asking, answering questions, and proving answers. It is not logical that a plain, flat style will always work effectively in all three categories. Figurative language, extended comparisons, analogies, paradox, humor--all these techniques have a place in technical writing, as Elizabeth Harris points out in "Applications of Kinneavy's Theory of Discourse to Technical Writing" (College English, February 1979). Oversimplification of style could lead to an improper oversimplification of subject.

While exploring the question of technical styles, we might also consider the place of technical language in this type of writing. A commonplace in teaching style to beginning technical writers is to avoid the use of long, complicated phrases ("noun-stacking") and complex scientific or technical terminology when writing for a lay reader. Implicit in this instruction is the assumption that when writing for one's peer group or for more expert readers, the writer would automatically use more complicated language, examples, and organization. A more sensible approach would be to consider, in addition to the audience, how complex is the situation being described and then use appropriately simple or complex language. An adaptation of Thomas Kuhn's notions of "normal" science and paradigm shift could prove useful here. In The Structure of Scientific Revolutions, Kuhn traces the steps that occur when a major revision of science takes place; when, in other words, the fundamental assumptions and models that describe the world are changed--from Ptolemy to Galileo, Galileo to Newton, Newton to Einstein. Kuhn distinguishes between "normal" science, which is the kind of experimentation that proves the validity of these central assumptions (which he calls paradigms), and what we can call "investigatory" science, which attempts to explain anomalies in nature or to describe phenomena not covered by the current paradigms. When scientists are working with an accepted world-view, the language they use to report investigations and hypotheses is accepted and understood by other scientists because they all see the world and its phenomena in roughly the same way. There are no sharp differences in defining terms. When scientists move into areas of investigation not adequately described or considered by "normal" science, their writing becomes more figurative, imaginative, and "strange." Technical terms tend to disappear since they are not adequate to describe these new thoughts or relationships. Unusual new relations must have new terms, and they will often be described in striking, even disturbing ways. So could it be with "normal" and "abnormal" technical writing. By considering the relation of subject matter to the body of general knowledge in the area, as well as the nature of the audience we wish to communicate it to, we can discover and describe a more flexible and wide-ranging technical style.

Dr. Corbett's paper also calls our attention to the third part of the rhetorical triangle, the writer. After reading his paper, I began to think about what we assume that the beginning technical writer knows about writing. How much time should be given to introduction or review of the modes he mentions (definition, cause and effect, comparison and contrast) in a technical writing course? Are these "modes of thinking" actually the best models we can choose? We need to determine how much the students know about using these rhetorical modes. Obviously, the position of the technical course in the curriculum (sophomore or senior level) and the number of courses required or available will decide the question in many cases. Often the decision is to teach only the shorter forms. Other technical writing courses place most of their emphasis on the students' learning to design entire reports and their constituent parts. Depending on the students' backgrounds and plans of study, one of these courses could suffice. We return to the point that we are teaching technical writing. It seems very necessary for all writing instructors to communicate about what kinds of writing their students are doing so that they cover the most material most effectively. Some of the introductory work on the shorter modes could be covered in freshman classes, as is done in some technologically-oriented colleges now.

The question of teaching modes also brings us to the split between those who teach long report formats for the students to fit their work into and those who teach large rhetorical strategies (determining the report's audience and function) first. Perhaps the two methods are not so far apart, but are assuming that their students already know those subjects that they do not discuss or emphasize. If we begin by deciding on the function and audience of the report, could we not be assuming that the writer already knows the most effective mode of presentation and will naturally use it? And if we start by teaching various formats, are we not assuming that the function of the report is implicit in the well-designed format and that the writer already understands the functions? We should always be aware of the limitations of any approach and try to give our students as much useful information from every sound approach as possible. It seems likely that we can integrate several approaches into an effective program.

The proponents of both methods would, as both papers in this session do, agree that we are all teaching technical writing, and that we are all looking for more research and inquiries into how best to teach our students to be effective and flexible writers who can always get their message across in the most efficient manner.

Panel D-10

New Directions in Technical Communication:

The Educators' View

# NEW DIRECTIONS IN TECHNICAL COMMUNICATION: THE EDUCATORS' VIEW

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## ABSTRACT

The field of technical communication is changing rapidly. Each year the many new teachers who enter the field seek information on successful methods for developing and teaching technical writing courses, while experienced teachers seek information about designing advanced courses and developing technical communication programs. This panel focuses on new directions in technical communication and presents the educators' view on four key issues: (1) preparing to become an effective technical writing teacher; (2) teaching to have lasting impact on students' writing quality; (3) assessing what needs to be taught in the introductory technical writing course; and (4) developing advanced courses and degree programs in technical communication. The session is a corollary to the panel, "New Directions in Technical Communication: The View from Industry." Together the panels are intended to provide a forum for discussion of methods of structuring, developing, and teaching effective technical communication courses and programs to enable composition teachers to achieve the perspectives of the 1980s.

## INTRODUCTION

Ours is a technological age--an information age. It is also an audiovisual age. Advances in computer technology and communications networks have resulted in audiovisual media and learning systems which will significantly affect the practice and teaching of technical communication: Word processing systems, computerized bibliographic retrieval systems, computer-aided instruction modules for teaching basics, videotaping, closed-circuit television programming, and remote learning centers are just some examples. Technological advances, the information explosion, the nationwide literacy crisis, and the emphasis on audiovisual communication together have brought to a focal point the need of professionals in academia, business, government, industry, and the sciences for training in written, oral, and graphic communication. In recent years there has been increasing demand for courses and programs in scientific and technical communication.

Each year many new teachers enter the field of technical communication, and they seek information on successful methods of developing and teaching scientific and technical writing courses. At the same time, experienced teachers seek information about designing advanced courses and developing technical communication programs. It is the purpose of this panel to focus on new directions in technical communication and to present the educators' view on four key issues: (1) preparing to become an effective technical writing teacher; (2)

teaching to have lasting impact on students' writing quality; (3) assessing what needs to be taught in the introductory technical writing course; and (4) developing advanced courses and degree programs in technical communication. The underlying hypothesis is that teaching technical communication successfully depends upon the continuing cooperation of academia and industry--upon interaction and dialogue. Thus a corollary panel on New Directions in Technical Communication presents the view from industry. Together the panels are intended to provide a forum for discussion of methods of structuring, developing, and teaching effective technical communication courses and programs.

## PREPARING TO BECOME AN EFFECTIVE TECHNICAL WRITING TEACHER

Technical and scientific writing is, as James W. Souther has said, "a discipline just as is creative writing and is journalistic writing," with a set of basic rules that separate it from related fields. Although technical writing shares with the other disciplines a common base in language and the ability to use it well, technical and scientific writing has a clearly developed set of basic principles, its own paradigms [1]. Technical writing is "objective; heavily involved with graphics, formats, and report design; action-oriented; practical; persuasive; situational; analytical; audience-oriented; highly rational and disciplined; *[and]* important," to use Thomas E. Pearsall's summary [2]. To teach technical writing well requires not only training in language, but also knowledge of the principles of the discipline, particularly of analytical thinking and problem solving. It also requires an understanding and acceptance of technology, science, and business, and a willingness to adapt to technological change [2,3].

What resources are available to the literature-trained Ph.D. preparing to teach technical writing? That is the question John A. Walter addresses in his paper, "The New Technical Writing Teacher." Professor Walter focuses on the means by which the new or inexperienced teacher of technical writing can prepare for effective teaching. Initially he considers the relationship of technical writing and traditional exposition to show how knowledge of the latter contributes to knowledge of the former. A number of resources are available to the new technical writing teacher [4,5], and in his paper, Professor Walter reviews useful texts, bibliographies, and journals. He lists important professional societies and organizations, and provides information about institutes and workshops on the teaching of technical writing. He discusses strategies that can be used in-house to develop expertise as well as means of interacting with industry to obtain first-hand knowledge of the field. His primary emphasis is on what the new or inexperienced teacher can do, largely on his or her own, through reading, interviews, conferences, and research to become an effective technical writing teacher.

## TEACHING TO HAVE LASTING IMPACT ON STUDENTS' WRITING QUALITY

A second issue of concern to technical writing teachers is the quality of students' writing and the type of training needed to have lasting impact on that writing. James W. Souther addresses this topic in his paper, "Writing as Decision-Making." Professor Souther indicates that if we teachers wish to have a lasting impact on the writing quality of our students, we must focus on the elements that are essential and basic: an awareness of how the language functions and an understanding of the process we call writing.

As Professor Souther points out, "communication is not achieved just by writing; what we write must be delivered, read, comprehended, and used. More than one person is involved; writing in the world of work always has a purpose and a reader, and the situation always impacts the writer and the product." In a writing course, situational analysis and its relationship to writing decisions are what we have to teach.

Most writing courses concentrate on language awareness yet few really come face to face with the decision-making that is the heart of the writing process. In his paper, Professor Souther examines that decision-making to identify factors which influence it, and to suggest how we might go about teaching it.

ASSESSING WHAT NEEDS TO BE TAUGHT IN THE INTRODUCTORY COURSE

Introductory courses in technical writing are usually designed to prepare students majoring in the sciences, engineering, health care, and business for the writing they will do in their careers. A number of topics may be covered: Our introductory course at The University of Texas at Arlington, for example, includes basic techniques (definition, description, explanation of a process, instruction writing, classification, and analysis), technical style, audience analysis, correspondence (including the resume and cover letter), and the formal report. Recently we have added oral presentation. Other introductory courses may include memoranda, proposals, various types of nonformal reports, feasibility studies, and advertising among the topics covered.

A number of factors influence the choice of topics and the emphasis they receive in the introductory course: Among these are (1) tradition; (2) the instructor's area of expertise; (3) the mix of students in the course; and (4) the level at which the course is offered. Another set of factors includes (1) availability and access to audiovisual media, word processing systems, and computerized bibliographic retrieval systems; (2) reliance on research; (3) reliance on results of surveys; and (4) dialogue and interaction with industry.

What topics should be emphasized in the introductory course to prepare students for the kind of writing tasks they will do in industry? To answer this question, Paul V. Anderson has surveyed more than 800 graduates of seven departments at Miami University (Oxford, Ohio) that send students to introductory technical writing courses. He reports the results of that survey in his paper, "What Really Needs to Be Taught in Introductory Technical Writing Courses: A Survey of Graduates of Seven University Departments."

Much of the information previously available has been based on study of one homogeneous group of engineers [6]; Professor Anderson's survey includes data from six nonengineering departments (Chemistry, Home Economics, Office Administration, Pulp and Paper Science, Systems Analysis, and Zoology) as well as one engineering department (Engineering Technology).

In the survey, Professor Anderson asked graduates to indicate the amount of time they spend writing; the importance they attribute to writing; and the kinds of writing they do (advertising, articles for professional journals, formal reports, general instructions, letters, memoranda, minutes of meetings or conversations, preprinted forms to be filled out by the respondent, proposals for funding or approval of projects, scripts for speeches or presentations, and step-by-step instructions). He has used both descriptive and inferential statistics to analyze the results for the entire group, ad well as to determine whether the results obtained from each department differ significantly from the results obtained from the others. His analyses suggest that many technical writing teachers need to adjust the objectives and content of their courses to meet the needs of their students.

## DEVELOPING ADVANCED COURSES AND DEGREE PROGRAMS IN TECHNICAL COMMUNICATION

As the demand for technical writers grows, there is a corresponding demand for curricula to prepare students for roles as professional communicators. It is this area that Thomas E. Pearsall covers in his paper, "Building a Technical Communication Program."

When the matter of going beyond the basic course in technical writing and developing a program in technical communication is considered, several questions arise, as Professor Pearsall has noted: What type of program? Is there a need for the program? What should be in the program? The technical communication program may be considered at several levels: (1) a course or two beyond the basic technical writing course, aimed primarily at technical students; (2) four or five courses beyond the basic course, again aimed primarily at the technical student, but with some students who may wish to become professional communicators; and( 3) a full program where a major in technical communication is given [2].

Students from technical communication programs must have excellent written, verbal, and graphic communication skills; knowledge of analytical thinking and problem solving; technical knowledge and access to technical terminology; a willingness to accept technology, science, and business; and flexibility to adapt to technological innovation. "Technical writers are the great interpreters of our age," as Professor Pearsall states, and a program in technical communication cannot be based on writing alone. An undergraduate technical communication program must follow the dictates of the school concerning curricula while being an interdisciplinary program that produces people capable of working as professional technical communicators [2]. It must contain courses in communication as well as courses in the technical area in which the student wishes to specialize.

In his paper, Professor Pearsall describes the building of a technical communication major. Based on experience and research, he details the components needed in technical communication majors, such as technical writing and speech, technical graphics, interviewing, and communication theory. He discusses the environment the major needs to succeed and the job market for graduates. He recommends the development of an advisory group.

## SUMMARY

Technical communication is a rapidly developing discipline. A number of resources exist to help the new teacher prepare to teaching technical writing effectively: texts, journals, professional societies, conferences, institutes and workshops, interviews, and internships in industry. To have impact on the quality of student writing, teachers must focus not only on language but also on situational analysis and writing as a decision-making process. To develop courses and programs teachers must assess objectives and be willing to adapt: to respond to trends and technological advances, to incorporate results of research and empirical studies into the design of introductory and advanced courses and degree programs, and to interact with industry to establish and maintain open channels of communication. With proper planning and selection of courses and the proper environment, technical communication programs can succeed and flourish.

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# WRITING AS DECISION-MAKING

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If as teachers, we wish to have a lasting impact on the writing quality of students, we must teach those aspects of writing which are most significant, most common, and most constant in the writing experience. As I see it, two such basic aspects demand our attention: 1) an awareness of the language and the ability to use it effectively, and 2) an understanding of the writing process and those decisions which are fundamental to that process. Most writing courses concentrate on the first of these elements. Basic writing courses designed to increase the awareness of students and to help them develop their language skills are an essential to our writing programs. Such courses are common to all kinds of writing; language skills are just as basic to fiction as they are to journalism or to informational writing. Yet, as excellent as such courses are, they are only part of what the student needs. They are not the "end" of writing; they are the "platform" for the teaching of writing.

The realization that we cannot effectively teach professional and technical writing in a vacuum is a growing one. Today article after article and book after book express the need for bringing new dimensions into our writing classrooms. Tom Pearsall's Audience Analysis (Ref. 1), Mary Coney's comments on the "mock reader" (Ref. 2), Myron White's paper on "The Informational Requirements of Audiences" (Ref. 3), Don Cunningham and Tom Pearsall's view of the "communication triangle" (Ref. 4), and David Carson's "Plea for Greater Realism in Identifying the Fictive Reader" (Ref. 5) along with many other articles have made the reader an integral part of the writing formula. David Ewing in the Preface to the First Edition of Writing for Results (Ref. 6), states, "The approach to writing taken here is more situational; that is, it is based more on the facts of the reader/writer relationship in particular situations than on set rules and prescriptions." Here, Mr. Ewing suggests that there is more to the situation than just the reader. Mathes and Stevenson in the Preface to their book (Ref. 7) echo this same idea by stating, "This book focuses on the questions a writer must answer first: who is to read the report, what do they want to know, what does the writer want to accomplish, and how should the report be structured to meet these needs?....We begin, in short at the beginning."

Yes, these are the beginning questions, but more importantly, they flow through the whole of the writing process; they are not questions answered quickly and easily at the beginning of the process and then dropped as the writer moves on to other considerations. They do, in fact, become the guiding principles, the operational basis, for the decision-making of the writer throughout the writing process. David Ewing, in the Preface to his Second Edition (Ref. 8), states, "if there is one 'secret' of the good writer in business, government, science or the professions, it is--and always has been--an instinct for situational analysis."

Situational analysis and its relationship to writing decisions are what we have to teach When I spoke as a member of that first MLA Technical Writing Panel, I spoke of the need for context for assignments in our writing courses (Ref.9). What I was referring to, of course, was providing full-bodied assignments that force students to be involved with situational analysis for each and every writing assignment. For it is the ability of our students to analyze a situation and to write responsively to it that becomes the most important principle in our teaching.

We need not get deeply involved in the philosophical question of whether we can really know our readers. Of course we cannot have complete information, but that does not stop us from acting or being as responsive as we can based on what we do know. When knowledge is insufficient, we must operate on the basis of assumption. Philosophically, our readers may be "fictive," but if we err in the writing we submit, there's a strong sense of realism about the supervisor who takes us to task for our mistakes.

Communication is not achieved just by writing; what we write must be delivered, read, comprehended and used. More than one person is involved; writing in the world of work always has a purpose and a reader, and the situation always impacts the writer and the product. In a writing course, then,we must begin with the situation, and we must provide this element for every assignment if our students are to learn to be situation reponsive.

Writing is a process of making decisions. As we reflect about our writing, we are constantly forced to make decisions: decisions concerning our objective, our purpose; decisions concerning the message and the reader; decisions on illustration and layout; decisions on tone and style. There are, of course, many other lower level decisions: How do I spell that word? What's the word I need here? Should I put the data here or place it in the Appendix?

Writing is difficult because thinking is difficult, because making decisions is difficult. Writers are most frequently frustrated because they have so little on which to base their writing decisions. Often it seems like a matter of personal preference, with no principles to be applied, with no basic rationale. The problem solving approach, the analytical approach, the design approach all emphasize asking the right questions. If our students can be taught to ask the right kinds of questions, then the answers they get to those questions will provide them with the basis for making writing decisions now and in the future as well.

But it is not enough that our students know what questions to ask, they must also know which writing decisions are impacted by those answers. What questions bear on what writing decisions? What impacts do the answers to those questions have, and where is that impact to be felt? To be effective teachers, we need to relate situational analysis to specific writing decisions. Our task as teachers is to bring situational analysis into our classrooms, not as a discussion topic but rather as the modus operandi of the course itself. We need to teach writing responsiveness.

## HOW DO WE START?

Any new approach requires extra effort, and writing teachers always tend to be overloaded anyway. Let me assure you of two things: (1) it isn't nearly as difficult as it sounds, and (2) it will be the most exciting development in your classroom experience.

First, we must ourselves develop a sense of situational analysis. We must become aware of how people read, when they read, why they read, what kinds of questions they want answered, what they skip over, and how they make decisions. We must get answers to these kinds of questions for the various audience groups: expert, manager, general public, etc.

Second, we need to learn more about communication, especially in the world of work. We need to identify how information systems interact with other systems. We need to develop a feel for the reading habits and the informational needs of people in various roles. In short, we need to expand our exposure in real world communications. Spending two or three summers as a writer or editor in industry or government not only provides summer income but a wealth of insight and exposure to enrich the classroom.

But we need more than exposure to actual communication situations. Third, we need to relate specific situational elements to the individual writing decisions that must be made. What elements of the situation impact selection of content, organization, level of presentation or emphasis, for example. If situational analysis is to become an operational approach to writing decision making, we must clearly identify the nature and the points of their interaction.

## WHAT DO WE DO?

First of all, we can't do everything at once. We eat an apple one bite at a time; we develop our course one step at a time.

1. Focus on two or three primary audiences. I suggest Tom Pearsall's "expert," "executive," and "layman" audiences. Read his Audience Analysis (Ref. 10) as a starter, then turn to other audience oriented materials. Avoid the combined audience at first, but read what Tom has to say about it in Reporting Technical Information, 4th edition (Ref. 11). If you can, read a good summary of the findings in communication research (Ref. 12).

2. Develop several writing assignments that have a specific purpose, and audience. Create the situation, the context for each, and hold the students responsible for writing that is responsive to each situation. Be prepared to discuss the situation over and over again, but make the student arrive at the writing judgments. See my MLA paper (Ref. 13) for suggestions, or write for copies of some of our assignments.

3. At the beginning, limit your discussions of situational analysis and apply it to your specific assignments. By doing this you develop an in-depth view of those specific situations without wandering off into less defined areas. As you gain experience and confidence, you broaden out your application of situational analysis.

4. Relate individual elements of the situation analysis to specific kinds of writing decisions.

The purpose of a piece of writing has direct impact on writing decisions such as the selection and organization of content and the need for emphasis. Questions of content relevancy, for example, usually come right back to purpose.

The use of documents varies. Some are read; some are not. Some serve as references; some as a basis for public discussion. Some are complete; some need updating. How we see a reader using our writing product influences decisions on layout, form, publication process, paper and binding, and often organization. In explaining the differences between the organization of a dictionary and a thesaurus, one is quickly reduced to a view of use.

The audience has a direct impact on decisions of level or presentation: i.e., special terms, mathematics, detail, evidence, data. But audience informational needs strike even closer to the heart of writing decisions. Myron White's article discusses this in detail and should give the guidance you need (Ref. 14). Selection and organization of content often depends on how the writer views the informational needs of the reader. Reader interest, for example, is responsible for two different patterns frequently found in technical writing.

Experts, to use Tom's term, have a deep interest in how work is done, what data was gathered and what conclusions were drawn. They want to understand the work as well as the results. Is it any wonder then that most research writing has a "work-structured organization"? Almost all professional journal articles use this structure. The investigator of a number of alternative solutions to a problem might well focus on the following questions:

- what's the problem?
- what are the criteria for judging solutions?
- what are the alternative actions?
- how do they compare?
- what seems best?
- what should we do?

Managers, to use my own term, have a different interest pattern. Although they depend on their staff for evaluation and input, they must make the decision. This decision-making responsibility has its own set of questions, and its order and emphasis differs from that of the expert investigator just as their functions differ. The manager faced with making a decision might well ask the following questions:

- what's the problem?
- what should we do?
- why should we do that?
- what alternatives were considered?

Rather than try to ignore situational analysis, we should welcome the definition it brings to writing and the excitement it can bring to our classes. For situational analysis permeates the whole fabric of our writing; it underlies the whole range of our writing decisions. From selection and organization of content, through the use of illustration and layout, to matters of tone and style, situational analysis provides the insight for action and choice. Through it, we learn to write not only <u>to</u> our readers but <u>for</u> our readers. Situational analysis establishes the functionality of writing as its true test.

If we are to serve our students well, we must provide them with a knowledge of writing and language principles, but we must also provide them with a way of approaching future writing decisions. We must provide them

1. with a knowledge of the writing process,

2. with a knowledge of what questions to ask about each writing situation, and

3. with a knowledge of how specific writing decisions are impacted by the answers to those questions.

We shall succeed to the extent that we can relate our teaching to the specific writing decisions students will have to make, and to the extent that our assignments and courses match the real world. The more situational analysis becomes the working principle, the greater will be the challenge and the satisfaction for student and teacher alike.

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# BUILDING A TECHNICAL COMMUNICATION PROGRAM

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Recent research by Dr. Earl McDowell of our Rhetoric Faculty and myself found 25 programs in the United States with something either called or resembling a technical communication program. By program, I mean a program that grants a degree ranging from an AA to a Ph.D. The titles of some of the degrees will indicate somewhat the range of these programs: BA in Industrial Media; BA in Industrial Communications Specialist; MS in Science Communication; BA in English, Writing-Editing Option; AS in Technical Writing; BS in Technical Writing and Editing. These programs range in size from 2 students to 270. The total number of students enrolled is over 1400. Of the 25 programs, 17 have come into existence since 1970. Obviously, in a small way, it's a bit of a growth industry. It even has its own organization, The Council for Programs in Scientific and Technical Communication, an organization that was founded in Minnesota in 1974.

I address myself briefly to answering two questions that would likely be in the mind of anyone considering increasing the number of programs from 25 to 26. First, what is the market for technical communicators? Second, how does one go about setting up a program?

According to the 1980/81 Occupational Outlook Handbook, 24,000 technical writers and editors were employed in 1978. For a comparison figure, the same source records 45,000 people working as newspaper reporters in 1978. In 1978, 240 journalism schools turned out over 6,000 graduates into that 45,000 person market. (1) Assuming that something over one-fourth of the 1400 technical communication students graduate every year, the comparable figure is 400 into a market of 24,000. The odds do seem better for the technical communication students and, in fact, they are. The programs we have checked indicate that their good students are snapped up immediately, and even the poorer ones usually land a job. In our midwestern school we have recruiters from both coasts after our students despite the fact that most of our students seem to prefer the Minnesota area and most, in fact, do find work there.

What are the pay scales? According to the Occupational Outlook Handbook again, starting salaries for technical writers range from $8,000 to $19,000 a year. I suspect that graduates of technical communication programs are mainly in the high range of that spread. In 1980, of our 18 graduates, the lowest reported salary was $14,040 and the highest $18,900. The average starting salary for all of our graduates reporting was $16,740. The first two students hired from our 1981 graduating class have both received over $21,000 per year.

What is the outlook for the future? According to the Occupational Outlook Handbook, "Employment of technical writers is expected to increase about as fast as the average for all occupations during the 1980's. ... graduates of technical writing programs should be in particular demand, especially those with backgrounds in areas of growing importance such as computer science, environmental science, and electronics."

Where is the market both by industry and by region? As the above quote indicates, computer science, environmental science, and electronics are where many jobs are. Defense industries, aerospace, energy, and the health sciences are also fertile fields. Government at local, state, and federal levels hires technical writers. In general, any field that has a high technology product and a low technology user needs technical writers. A computer industry furnishing computers to a bank to be used by high school graduate tellers and clerks is a perfect paradigm of what I mean.

Regionally, the hot spots for technical writers are the Northeast, Texas, and California; however, technical writers can be found in every urban area of the United States.

The second question. How does one go about setting up a program to educate technical communicators? Hidden away in that question is another one: Is your environment suited to a technical communication program?

The first step in answering both these questions is to find out what it is that technical communicators really do. First of all, what do they write? The Occupational Outlook Handbook tells us this:

> Manuals, reports, and proposals make up the bulk of technical writing today; however, the work may take other forms. Technical writers may write specifications; prepare speeches and news releases; edit and write technical books; prepare articles for popular magazines; develop advertising copy, promotional brochures, and texts for exhibits and displays; and handle technical documentation.

How do they go about this work? Technical writers are the great interpreters of our age. They begin by researching the technical knowledge they are to write about. Often, they start with the scientist or technician who possesses the needed knowledge. There is an interview often followed by much poring over documents, schematics, and cryptic notes furnished by the scientist or technician. Out of this welter of information, the writer has to fashion a document that satisfies the technical expert with its accuracy and that also teaches, informs, and sometimes persuades the intended audience, usually people with much less technical expertise than the scientist or technician. Usually the technical writer works with a technical illustrator, but the writer must have a grasp of what the illustrator can provide.

In some shops, the technical writer turns the draft over to an editor who sees it through publication. In others the writer carries out this stage as well. More and more the writer may also be required to compose on word processing equipment.

However, this bare recital is not enough for you to really know what it is that technical writers do. You have to be with them for a while or better still try your own hand at technical writing. Get to know technical writers. If you have a local chapter of the Society for Technical Communication nearby, join it. If, after all this, you still want to think about a program in technical communication, form an advisory committee of practicing technical writers. Such a committee has two great advantages: it keeps you in touch with the needs of practitioners and it is the start of a network of potential employers for your students. It has one disadvantage. Each member of the committee will want to train people for the precise needs of his or her shop. Such demands frequently are too narrowly vocational for a university setting or for a university philosophy. This can be a critical point. We are told that most of our graduates will go through one or more career changes in their lifetimes. Education that is too narrow may hinder the ability to change. Despite this disadvantage, an advisory committee is a necessary part of your program development.

Of course, you can also learn from existing programs. In 1979, we revised extensively our program in technical communication that we had begun in 1971. As part of the revision process, we queried three groups of people about our program: graduates of the program, members of the Society for Technical Communication (STC), and potential employers of our graduates. The complete findings are reported elsewhere. (2) However, I'll give you some of the key points here.

The participants in the survey were asked to rate the communication courses in our program on a scale of 1 (very unimportant) to 5 (very important). Obviously, this survey is biased to a degree by the courses we offer in the major. The STC members ranked the top eight courses in this manner:

1. Scientific and Technical Writing
2. Interviewing
3. Scientific and Technical Presentations (speech and graphics)
4. Writing for Publication
5. Scientific and Technical Graphics
6. Transfer of Technology
7. Professional Writing
8. Direction of Training in Business and Service Organizations

Potential employers ranked them this way:

1. Scientific and Technical Writing
2. Transfer of Technology
3. Scientific and Technical Presentations

4. Writing for Publication
5. Effective Listening
6. Scientific and Technical Graphics
7. Professional Writing
8. Interviewing

The graduates ranked them this way:

1. Scientific and Technical Writing
2. Scientific and Technical Presentations
3. Advanced Public Speaking
4. Scientific and Technical Graphics
5. Writing for Publication
6. Professional Writing
7. Interviewing
8. Studies in Organizational Communication, Conflict, and Change

Common to all three groups are these six courses:

- Scientific and Technical Writing
- Scientific and Technical Presentations
- Writing for Publication
- Interviewing
- Professional Writing
- Scientific and Technical Graphics

While writing is the skill most in demand, notice that all three groups expect the student to be educated to speak, interview, and understand graphic presentation. Our graduates also tell us we must stress report production and management more than we do.

In more recent research, McDowell and I classified technical communication competencies into six groups and asked existing programs if they had courses in the groups. Eighteen programs replied with these results:

| Area | # Schools |
|---|---|
| . Writing and Editing | 16 |
| . Communication Theory | 11 |
| . Organizational, Managerial, and Training Communication | 10 |
| . Graphic Communication | 9 |
| . Oral Communication | 6 |
| . Media Communication | 5 |

What about skills other than communication skills? If the program you envision is an undergraduate one, you must see to it that your students acquire certain knowledge necessary to their survival as practicing technical writers. In our program, for example, in addition to 70 quarter hours in a communication core, we require 4 hours of math, 4 hours of computer science, 18 hours of physical and biological science, and 20 hours of technical electives. In the latter, students take courses in areas in which they plan to work--computer science or biology, for example. We also require courses in the history of science. We encourage additional courses in computer science and in statistics.

Sixteen of the eighteen programs reporting require internships for their students. Here the student spends a term working in the field under the joint supervision of a practitioner and an academic instructor. Such experience is absolutely essential to students. It puts things together for them in a way that classroom work simply cannot do.

If the program you plan is a graduate one, you may be able to depend more on the scientific and technical knowledge your students bring with them. This allows you to concentrate more on the communication core. But I urge you not to allow students at any level to go out into the field naked of some knowledge of math, computers, and hard science.

After you learn what should go into a program, you must face squarely the question of whether you really have the proper environment for it. A proper environment means that you have people on your staff or in related departments who can teach such subjects as graphics, oral communication, interviewing, and communication theory. Course work in science and technology should be available. Your staff should be friendly to the idea of a program and honestly receptive to what it means in course work. If they merely see it as an occupational camouflage for teaching more literature, the program will founder.

Your community environment is also important. Not all existing programs are in urban areas or close to them, so I can't state categorically that such a location is necessary, but it certainly helps. In such a location, you will find practicing technical writers for your advisory committee. In such an area, you will find internships readily available. In such an area, your students may ultimately find employment.

To summarize. There is a good market for technical communicators that at least 25 schools are already supplying. The market seems large enough for more schools. But programs should be intelligently planned based upon a good deal of knowledge that already exists about what technical communicators need. They should not be a hastily put-together collection of writing and editing courses. And, finally, such programs need the proper environment to flourish.

Schools and Departments Offering Technical Communication Degrees

Boston University: Science Communication
Bowling Green State University: Technical Writing Programs
Carnegie-Mellon University: English Department
Clarkson College: Humanities Department
Colorado State University: Technical Journalism Department
Florida Institute of Technology: Humanities Department
Los Angeles Trade-Technical College: Art Department
Metropolitan State College: Industrial Communications Department

Miami University, Ohio: English Department
Michigan Technological University: Humanities Department
University of Michigan--Ann Arbor: Interdisciplinary Engineering Program
University of Minnesota: Rhetoric Department
New Mexico State University: English Department
North Carolina State University: English Department
Oklahoma State University: English Department
Oklahoma State University Technical Institute: Technical Writing Department
Oregon State University: Journalism Department
Pittsburg State University: English Department
Polytechnic Institute of New York: Humanities and Communications Department
Rensselaer Polytechnic Institute: Department of Language, Literature, and Communication
Rock Valley College: Communications Division
South Dakota State University: Department of Journalism and Mass Communication
University of South Dakota at Springfield: Technical Communications
University of Washington: Scientific and Technical Communication Program
University of Wisconsin--Stout: Technical Communications

NOTES

[1]Paul V. Peterson, "Enrollment Surge Again, Increases 7% to 70,601," Journalism Educator, 33, No. 4 (1979), 3-8.

[2]Earl E. McDowell, L. David Schuelke, and Chew Wah Chung, "Evaluation of a Bachelor's Program in Technical Communication," Journal of Technical Writing and Communication, 10 (1980), 195-200.

NEW DIRECTIONS IN TECHNICAL WRITING IN BRIEF

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This session provided suggestions on teaching technical writing to arm the new teacher and bring the veteran up to date. The suggestions concerned resources for research, methods for the classroom, content of such courses, and administration. John A. Walter opened with an overview of the course and comments about publications and persons to interview for current information. James W. Souther stressed the need to teach writing as a process and emphasized the element of decision-making in writing. Paul Anderson addressed the question of content: he emphasized the forms of writing graduates reported that they were required to produce on the job, particularly memos and fill-in forms. The traditional articles often stressed currently in technical writing classes were low on the list. Thomas Pearsall focused on administrative questions in writing programs that go beyond the one introductory class. Such programs may, as at the University of Minnesota, prepare professional technical writers. Or they may be directed at professionals who write--engineers and scientists, for example, who enroll in a joint major or minor in communication because they see reporting as something equally important as the technical work on which they report.

Discussion after the papers covered several topics. One concerned the difference in content between an introductory and an advanced technical writing course. Advanced courses may emphasize particular techniques, like editing technical material. Or they may concentrate on a particular form, for example, a course in dissertation-writing, or proposals, or journal articles, or writing for the public, or historical essays in science. Such courses tend to be conducted as seminars, with students spending much time reviewing each other's writing. Another question centered on the advantages of homogeneous (for example, all chemical engineering majors) as opposed to heterogeneous (students from several majors) groupings in classes. Homogeneous classes encourage team-writing projects and peer-review, since all the students are familiar with the same field--and often with one another. They also may ease the teacher's lot since he or she then only has to become familiar with one field. Such groupings, however, pose scheduling difficulties. Moreover, heterogeneous classes have the advantage of requiring students to abstain from their usual jargon to be clear to one another and provide a good simulation of the multiplicity of specialties represented on many technical teams in business and industry.

The proper home for instruction was also discussed. Commentators stressed the advantages of interdisciplinary approaches, whether the instruction centers in an English or a technical department. A program in an English department, for example, could profit from an advisory board composed of people from technical departments as well as local businesses. Informal collaboration with technical colleagues was encouraged; if possible, team-teaching can be effective. Some questions concerned the Anderson survey of graduates, particularly the differences in writing tasks between those in entry-level jobs and those more advanced in their careers. In general, the panel encouraged teachers to undertake more such surveys of document design in corporations, both for implications concerning necessary preparation in undergraduate courses and as evidence about the forms of information and reader needs in current practice.

Panel D-13

# Oral Technical Communication:

# Effective Models

INTEGRATE ORAL COMMUNICATION WITH

TECHNICAL WRITING: TOWARDS

A RATIONALE

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Why teach oral communication in what is usually considered a "writing course"? Surely instructors have enough to do just to cover the principal strategies of technical writing within a single term. "Not only that," declares the beleaguered instructor, "but my forte is writing--specifically technical writing--not speech!" Such a position may be somewhat extreme, for many of us probably include an oral presentation as a component of the formal report assignment at the end of the term.

However, our proposal calls for us to integrate oral communication with technical writing. Although the word "integrate" has several meanings, the first one listed in our dictionary reads as follows: "To bring together into a whole; unify" (1, 338). Tacking an oral presentation onto the end of a technical writing course is not the same thing as integrating oral and written communication. Oral communication should represent a substantial portion of our instruction throughout the course. By integrating oral communication with writing, we offer what may be the only opportunity our students will have to learn and practice interpersonal skills. By linking oral communication to written communication, we acknowledge the importance of small-group interaction in developing ideas that are ultimately transferred into written discourse. We see three reasons for integrating oral and written communication:

- The technical professional's work day is largely comprised of oral interactions of various kinds.
- The role-taking skills required for effective oral communication can be applied to the process of audience analysis for job related writing tasks.
- Effective oral communication can help resolve conflicts between individuals and between groups.

Let's examine these reasons.

## Workday Activities

A growing body of evidence suggests that technical professionals spend a great deal of their time on the job engaged in small-group conferences. Distinguishing large-group oratory from small-group interaction, R. John Brockmann points out how "statistics and interviews with professionals have demonstrated that it is small-group interaction--a qualitatively different sort of communication--that carries much more of the burden of communication in business and industry" (2, 285). Often important writing tasks are linked inextricably to on-going small-group exchanges. For example, in his argument for the use of the storyboard as a tool for preparing formal bid proposals, David Englebret describes the results of oral exchanges among members of the organization's proposal team: "Assembling the entire proposal team to preview the Storyboards promotes creative thought, fosters cross-fertilization of ideas, uncovers any loopholes in the message, and ensures consistency of approach. It tends to force the team to think in the customer's terms--what questions he may want answered, what concerns he may have" (3, 117).

Engelbret has described the value of dialogue to the process of rhetorical problem solving. Oral exchanges generate and shape the content of the message according to the needs of the audience. Joan Rymer Goldstein has found that the content of written reports is frequently "filtered" through such dialogue, but many entry-level technical employees are not prepared to translate informal oral exchanges into writing. They do not fully understand how oral interaction relates to writing (4, R-158).

Moreover, technical employees are often ill-prepared to represent their companies in public. This responsibility has been thrust upon technical personnel in recent years as companies discovered the importance of explaining their programs and policies to a public seeking greater accountability. According to John Burk of Westinghouse, the testimony before a legislative committee which fails because it was too technical for legislators to comprehend costs at least twice as much as effective testimony. The company must find additional opportunities to state its case clearly and convincingly if its goals are to be advanced (2, 2). Mr. Burk blames these problems on corporate representatives who fail to "consider the experiences, the biases and the level of understanding" of the very audience they want to reach, a failure due perhaps to a system of training that has taught them to "deal in complexities, minute details and elaborate cause-and-effect relationships" (5, 5). He advocates the inclusion of oral communication in the technical writing syllabus.

## Applying Role-Taking Skills To The Writing Task

Another reason for integrating oral and written communication can be found in an emerging model derived from developmental psychology, linguistics, and related disciplines. The model rests on the assumption that the processes by which the adult learns to write are analogous to those by which children acquire language. According to Julia Falk, a proponent of this model, writing and speech are two different but "co-equal" ways to express language. Our understanding of how children learn to talk has implications for understanding how adults learn to write, for both processes are instances of language acquisition (6, 437).

A common element in this "parallel processes" theory is the concept of role-taking. Developed by John H. Flavell along the lines of Jean Piaget's theories of egocentrism in the speech of young children, the concept of role-taking describes a set of cognitive skills which enables the child to make inferences about the listener's needs, intentions, perceptions, opinions, beliefs, intellectual capacities, and so forth (7, 5). Note how Flavell's description of role-taking resembles John Burk's analysis of communication failure due the speaker's inability to, as Flavell might have put it, "take the role" of his listeners. Flavell calls these role-taking failures "intellectual egocentrism." It is, he says, "an inability, in our terms, to search out the role attributes of others, compare them with one's own, and make effective use of the comparison in any of a variety of adaptations" (7, 16-17).

Sarah Lundsteen uses Flavell's models of egocentric and non-egocentric communication in her work in listening theory. A non-egocentric communication consists of three stages:

1. The speaker apprehends events and codes them for himself or herself.

2. Before and during the speaker's communication to the listener, the speaker attempts to discriminate those attributes of his or her listener that appear to be pertinent to the listener's ability to decode the speaker's message about the events.

3. With this information in mind, the speaker recodes the events as a message he or she thinks is appropriate for the listener's needs. The speaker may have to actively suppress the tendency to allow his or her message to drift or regress to the egocentric error of coding just for himself or herself (8, 73).

An egocentric communication, then, lacks the discrimination of audience attributes which starts in stage two, and it lacks the recoding process of stage three. The audience receives the same message the speaker coded for himself or herself.

Professor Falk applies the theory of egocentrism to writing. Just as children's speech, according to Piaget, eventually becomes less egocentric as they mature, similarly novice writers learn to write according to the needs they have recognized in the reader (6, 442). She sees group interaction as a way to enhance the writer's sense of audience. Oral feedback on the effectiveness of the writer's draft enables the writer to adjust the message accordingly. Oral interaction of this kind becomes valuable for its immediacy.

However, Richard Gebhardt is quick to point out the difference between collaborative "evaluation" of a draft and truly collaborative writing (9, 69-74). The process, he contends, must start earlier. This kind of interaction begins with finding topics, defining audience, generating details, etc. Role-taking for the writing task can be augmented through role-playing. Students could play the role of the writer's audience, says Gebhardt, and offer constructive feedback.

Joan Goldstein also recommends collaborative activities early in the writing process; the oral interaction this method provides must be directed to a specific task and its completion (4, R-158). Collaboration becomes a problem solving act in the classroom just as it does in the work place. Note the collaborative process Engelbret described above and how oral interaction contributed to an improved sense of audience.

## Oral Communication and Conflict Resolution

When the terms "oral interaction" and "oral communication" are used, one tends to think of the sender rather than the receiver. The importance of listening must not be overlooked. The so-called white collar worker spends at least 40 percent of the time at work listening (10, 564). Incalculable instances of faulty listening take their toll in conflicts between individuals and between groups. A course that integrates oral and written communication should address this problem. Indeed, courses requiring group writing projects could examine differences of opinion between group members by applying Rogerian strategies.

The question of how Rogerian strategies differ from traditional or Aristotelian argument has been discussed in depth elsewhere (11). It may be enough to look briefly at the benfits of introducing Rogerian rhetoric to our students. First, students learn that true listening is not passive. The Rogerian strategy can demonstrate the power of "active listening." Carl Rogers and Richard Farson use this term because active listening can change people. The active listener "tries to grasp the facts and the feelings in what he hears, and he tries, by his listening, to help the speaker work out his own problems" (12, 569). Conflicts between two people or groups of people are often dyadic. There is no third party to win to one's side and thereby win the case. The two persons, for example, may be organizational equals whose disagreement over procedures for solving a company problem delays action until circumstances or a third party settles the dispute for them. The hard feelings remain, however, making any further cooperative work between the two even more difficult to achieve.

Discussing Rogerian strategies can also help students better understand how writing and speaking differ. Although there have been discussions concerning the use of Rogerian strategies in written discourse, the approach did originate as a tool for use in dyadic oral situations. Part of its effectiveness is in a speaker's ability to use non-verbal messages in addition to active listening to reduce threat in the other party. Students could examine the advantages of resolving a problem through Rogerian means as opposed to writing a formal argumentative memorandum. What does the act of "putting it in writing" do to the situation?

## Conclusion

Integrating oral communication with technical writing offers several advantages. First, such an arrangement helps to prepare our students for the variety of oral communication tasks they will face on a day-to-day basis, including those requiring them to transfer information from the oral mode to writing. Second, through oral communication instruction and practice, our students can develop the skills of role-taking and apply them to writing tasks by means of collaborative activities initiated early in the writing process. Improved role-taking skills can help make our students better public speakers when they represent their companies; they can also enhance our students' sense of audience when they write. Finally, an understanding of Rogerian strategies offers alternatives to damaging confrontations when conflicts occur in organizational life. The papers which follow demonstrate specific efforts to integrate oral communication with technical writing.

NOTES

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THE TECHNICAL TALK:
MORE EFFECTIVE USE OF VISUAL AIDS

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ABSTRACT

While most technical writing teachers assign the oral report and insist on visuals, very few offer their students good classroom examples of technical report visual aids. However, a set of 35 mm slides on one teaching topic could be easily produced with neither expensive equipment nor much ability in graphic design.

INTRODUCTION

This past summer I attended a summer seminar for technical writing teachers at Rensselaer Polytechnic Institute. Most of the presentations were good, but one factor separated the good from the excellent speakers: the latter group had interesting visuals to accompany their talks. Not until that seminar did I realize my classroom failure to demonstrate this need to my students. I knew that the overhead projector and chalkboard that I commonly used had limitations, but I didn't have a background in graphics arts, nor did I want to spend a great deal of money on posters that would gather dust and scuff marks sitting in my office between semesters. On the other hand, my students would be joining business and industry as representatives of my university, and I was not providing them with even one good example of quality visual aids in an oral report.

Most textbooks offer information on oral reporting, but this advice is commonly limited to avoiding the dreaded schwa, or improving eye contact. Most of them also stress the importance of graphics, but seldom do they include information or examples of oral report visuals, and if they do, such samples, being confined to the printed page, do not easily lend themselves to a demonstration of use in an oral report.

The models of oral reporting available to students are the teachers' own presentations on the various aspects of technical writing. The visuals accompanying these talks are nearly always the blackboard and, occasionally, the overhead projector. Both of these are useful for communicating certain information--primarily listings; but they are static as well, for the visual impact of such devices is minimal. I cannot picture a professional giving a presentation before executives of a large corporation and relying on a blackboard. However, a teacher with interesting visual aids centered on one topic could demonstrate the effectiveness of a quality oral presentation.

One solution is a series of 35mm slides prepared on one aspect normally taught in the class, such as oral reports themselves, or the letter of application. The advantage of slides is that, unlike posters, they are easily stored in a small space on a bookshelf where they will not attract dust, and they offer large, colorful displays of visually-attractive information. They also allow a prepared sequence of material, and authentic, high-quality, professional samples.

Textbooks seldom discuss visual impact, and thus slides made from letters typed with different fonts should produce a useful discussion. After a few years of teaching, most instructors collect a supply of such sample communication. Some of these become ditto copies for the students, but such a method of reproduction does not do justice to a sparkling business letter. On slides, however, the letters will never crack or yellow with age, and the students will see the difference between a scribble, and a letter that demands the reader's attention

Virtually all schools offer slide projectors in the classroom if given 24 hour notice, and because slides enlarge on the screen, they can be seen by everyone. Some schools have staff who will make slides for faculty if the material is supplied; however, many teachers may find it easier to produce these on their own. Here is how:

MAKING SLIDES AS VISUAL AIDS

Obtaining Materials

Film catalogs contain stills from old movies to which the clever photographer may add comic dialogue or captions. Drawings from academic junk mail are also useful because publishers often ornament sale catalogs with little sketches. When these are photographed above typed lettering, they become title slides. For example, a picture of Falstaff pontificating in a Shakespearean setting may be matched with the caption "Giving the Oral Report." A Dickensian drawing of a Victorian sweat shop might be "Communication in Today's Business World."

Cartoons are always enjoyable for an audience, and many of them refer to job interviews, problems in communication, or work world situations the students will be confronting. Cartoons frequently will make a point that a teacher might strive for over several class periods.

Equipment Needed

* A single lens reflex camera

* Slide film (any speed will work). While Kodak offers special copy films, I recommend buying the cheapest. K-Mart's Focal Brand film works fine, ~~or~~ purchase Kodak's Kodachrome 64. High speed film is not ~~necessary~~ except for specialized work.
* A set of close-up lenses or extension tubes. If wealthy, buy a macro lens.
* Not completely necessary but useful is a tripod or a copypod (a tripod designed specifically for copying).
* If your camera does not have a timer, a cable release will be useful.
* Duct tape, available at any hardware store, will keep the material flat on the copying table; later it can be placed across those parts of the finished slide you don't want projected on the screen.

Making the Slide

1. Prepare your captions and visuals.
2. If possible, photograph on an overcast but bright day. Avoid any shadows crossing what you are photographing. If no clouds are available, indirect light is better than direct sunlight on the visual.
3. Set up your materials near a window and turn off electric lights. If you have a tripod or copy stand, attach the camera and place the visual material directly below the lens.
4. Use the necessary combination of close-up lenses or extension tubes until the camera focuses on only the material you want in the finished visual. Get as close as you can so the letters and figures will appear large in the finished product.
   a. Remember that most single lens reflex cameras show slightly LESS in the viewfinder than the film sees, so allow yourself some extra margin around the sides of the visual.
   b. Adjust the f stop (lens opening) and shutter speeds until the camera's light meter registers a slight UNDEREXPOSURE of one f stop or less. If your camera is automatic, set it to Manual and underexpose by one f stop.

> Hints: Most lenses are uniformly sharpest at f 8, so try for this opening; and avoid shutter speeds slower than two seconds because this may cause a slight color change in the film.

   c. Use a cable release or the camera's timer to avoid vibration.

## CONCLUSION

I have two sets of slides: one demonstrates the use of visuals, and the second, what makes a good letter of application. For some letters I have several slides, one showing the entire letter, to demonstrate the visual impact; another showing only the first paragraph, which is often the hardest to write. The slide materials came from old business reports and student-generated samples. My most successful visuals, however, are cartoons. They offer color and artistic interest that I could not provide.

Whenever I find potential slide material, I set it aside and wait until I have slide film with a few exposures remaining--a frequent occurrence after a vacation or family visit. Finally, I note this all on my income tax form because, of course, this is all deductible.

# FROM PAPER TO PODIUM

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## ABSTRACT

Four areas in the basic technical wri‐ing course lend themselves naturally to oral presentation.

1. Letters of application and resumes should be complemented with práctice in interviewing.
2. Technical description and process analysis papers should be supplemented with an oral product demonstration.
3. Test and malfunction reports should be followed with oral proposal for change.
4. The more extensive research paper, proposal, or project report should be adapted into a more formal oral presentation.

As speakers, students are taught how to develop skills of audience analysis, simplification of technical material, repetition, illustration for clarification, and effective delivery. As members of the audience, students learn how to listen and to evaluate. In addition, students have an opportunity to acquire information on subjects tha usually are not covered in any of their classes.

## INTRODUCTION

In the past ten years, the major request from employers who hire our graduates has been to teach students to write coherent, precise reports, using well constructed grammatically correct sentences. In the last three years I have also begun to hear a concerted cry for improvement in oral communication. As one employer so succinctly said, "Now that you have taught your students to write clearly and concisely, when are you going to get them to stand up on their feet and speak intelligently and convincingly?"

This is a most legitimate request since it has been estimated that anywhere from twenty-five to fiftv percent of a technician's time is spent in oral communication. Many graduates of technology schools begin their careers as field representatives; as such they are the company's liaison with the public, and, indeed, they must be able to explain the mechanical aspects of a situation or problem clearly and intelligibly.

Ideally every technical student should have a semester course in oral communication; however, since this is not required in most technology programs, the majority of students never take such a course. Therefore, I feel it essential to include as much practice in oral speaking as is possible in my basic Technical Communications Course.

As I see it, four areas in this course lend themselves to oral presentation. First, letters of application and resumes can and should be supplemented with actual practice in employment interviewing. Second, technical description and process analysis papers should be supplemented with an oral product demonstration. Next, test and malfunction reports should be followed by oral proposals for change. Finally, the more extensive research paper, proposal, or project report should be adapted into a more formal oral presentation. This paper deals with the actual construction of these four oral units. It does not dwell on the basic components of effective oral speaking such as audience analysis, and preparation and delivery of speech with which you are undoubtedly familiar.

## INTERVIEW ROLE-PLAYING

I have always begun my Technical Communication Course with a unit on writing letters of application and resumes. We used to discuss interviewing techniques; now we actually role-play, one student taking the part of the employer--interviewer, and the other, the part of the prospective employee--interviewee.

First, I define the dynamic, dyadic process of interviewing, discuss the role of the interviewer and interviewee in the employment interview, show how these roles can change during the course of the interview, delineate the interviewer's responsibility for controlling and directing the questioning and the student's responsibility in responding. We discuss the preprogramming that both participants bring to the dialogue and the influence of societal roles and situational variables. We talk about voice range, enthusiasm, diction, eye contact, and body language.

Next, I provide students with lists of questions usually asked by prospective employers--for example, "Why do you want to come to work for our company? Where do you see yourself in ten years? Why should we hire you rather than all of the other applicants we have interviewed today?" A most difficult question to answer is the most general one, so often asked--"Tell me about yourself?" Perhaps as difficult and even more startling are the very unexpected specific content directives occasionally given by an employer in an initial screening interview such as "Describe a one shot multi-vibrator, or draw and explain the operation of a J-K Flip Flop." We practice answering many such general and specific questions.

Students work in teams. They decide who will be interviewer and who will be interviewee and what company they represent. The interviewer does not tell the interviewee what questions he or she will ask. By participating in such mock interviews and listening carefully to themselves and the comments made by their audience of peers, students become aware of their gestures, diction, voice control, and of their reasoning processes. They learn to think before they answer, be direct, emphasize their strengths, compensate for their weaknesses, talk work and not employee benefits, and move from one point to the next without getting "hung up." They begin to develop a sense of timing and to know when to stop talking.

After each pair of students completes its interview, the audience provides constructive comments. If the class is small and there is sufficient time, we tape the interviews and play them back. This, of course, provides an excellent opportunity for self-analysis. However, even in the larger classes where we cannot tape the interview, the student reaction is positive. The students feel that as a result of the practice interview and the constructive criticism, they develop an interview know-how and poise which is most valuable when the mock situation becomes a reality.

## PRODUCT DEMONSTRATIONS

The second oral talk follows the unit of writing technical definitions, descriptions and analyses of process. These exercises give students experience in defining an object, describing its physical appearance and analyzing its functions. When they become industrial technologists, they should be able to write precise specifications, clear instructions, coherent reports of test analyses, and descriptive sales brochures. They should also be able to present oral product demonstrations when they represent their company at sales meetings and expositions. Therefore, in class, each student now has the opportunity to give an oral product demonstration which builds on the information in his or her technical description and process analysis.

Before the students structure these presentations, I emphasize the differences between a paper which is written for readers and a speech which is delivered to listeners. As Max Weber has stated, "Written language must ultimately be intelligible to the reader, but spoken language must be instantly intelligible to the listener." With this concept in mind, we stress the importance of accurate presentation and proper selection of facts, logical organization of material, and use of clear transitional phrases. We discuss proper use of note cards and visuals. We point out the advantage of the extemporaneous talk, spoken conversationally rather than the paper which is read mechanically or memorized and regurgitated in robot fashion.

This oral product demonstration very quickly convinces students of the need to identify the audience and adjust the technical complexity and density of information to that audience. They simplify the written material, adjust the pace, and slow the rate at which they unload highly technical facts. They use a multiplicity of visual aids--graphs, charts, schematics, actual objects to clarify. They adjust their tone from the totally objective to the more personal, informative voice, prepare their audience by telling them what to look for, repeating when necessary for emphasis, stressing advantages and disadvantages. The speakers enlighten the audience by using techniques of demonstration, logical analysis, and synthesis.

The subjects are, indeed, diverse and interesting to the audience of peers. Topics range from the description and operation of a Bi-Polar Transistor to the description of a dynamic microphone and how it records the snare drum, to the description of a multiplexer and how it fits into the computer system. The listeners become directly involved; they not only have the opportunity to question the speaker about how a particular mechanism or process works, but they must evaluate the content and delivery of each talk according to a detailed evaluation sheet.

## PROPOSAL FOR CHANGE

The third area that lends itself naturally to oral communication is the trouble or malfunction report, also called problem notification. In industry, once a failure is identified and the cause or causes isolated, the next step is to determine the long and short range rectification, commonly termed proposal for change. The written paper and it three minute oral counterpart provide students with the opportunity to reason logically, write clearly, and speak persuasively. Both the oral and the written reports describe the problem or problems that have occurred, state the change or changes desired, detail the reasons for the changes, and specify the ways in which the alterations or modifications will affect procedures, costs, personnel, etc. The oral presentation proves to students that in order to be clear and convincing, not only must they thoroughly perceive every fact with all of the cause and effect ramifications, but they also must synthesize and simplify for their audience.

For this presentation, two techniques are used successfully; the choice is determined by the size of the class. In a small class, the oral presentation is given in the traditional manner; students have the opportunity to question the speaker after his or her presentations. In a large class, two people can take the podium at the same time, one plays the role of the proposer of change and the other, the role of the supervisor questioning the validity of the proposal. The proposer must be able to defend his proposal. This interaction furthers the techniques practiced in the interview situation.

As with the product demonstrations, subjects are diverse, ranging from broken water mains in a college to faulty wiring in a machine shop to a bad thermocouple in a theater. And again, students evaluate their peers' presentations according to the detailed evaluation sheet.

## FORMAL RESEARCH REPORT

The fourth, lengthiest, and most formal talk given by the students is the oral presentation of their technical research paper. The students give a seven to eight minute talk based on a ten to twelve page technical research paper. The oral report rarely follows the exact pattern of the paper; students must select the important concepts and eliminate the minute details which are not relevant to audience interest. Since these papers are highly technical, the oral presentation requires more skill than the earlier talks. The speakers must again, but even more assiduously, adjust the pace; simplify, clarify and amplify the highly complicated text; reduce statistics; and illustrate the main ideas with striking visuals.

The most difficult task for accomplished writers, let alone students, is to edit their work and eliminate some of the unnecessary words and concepts. But, in the words of Noel Perrin, we all must learn "to perform plastic surgery and when essential, even commit infanticide." And so the students learn for example, in a speech on operational amplifiers to eliminate the mathematical equations, use fewer schematics and less technical language than they did in the written version. Or in a talk on flat plate solar collectors, students analytically interpret rather than just technically present the data on theory of operation. They emphasize implementation and application rather than formulas and specifications.

This qualitative rather than quantitative approach enables all of the students to share in each other's research. They are exposed to a significant number of technical subjects, and they absorb a great deal of basic information without becoming bored or confused by excess detail.

## CONCLUSION

Many students are initially intimidated by the prospect of oral communication, but I do force the issue after fully explaining my reasons for the torture. During the semester I repeatedly remind them that as they advance in industry, the ability to communicate clearly, concisely, and convincingly is increasingly important, and that every written report has its oral counterpart. I explain that my course objectives in the field of oral speaking are not just an academic exercise, but are directly responsive to the industrial demand.

For instance, in their professions, our graduates will constantly be making oral suggestions, explaining schedules, discussing policies, interpreting results of investigations, reporting on progress of projects, justifying departmental expenses, or making proposals. In short, in addition to having technological expertise, they must know how to listen, to think, to write, and to speak.

In an anonymous evaluation of the course last semester, only one of forty students claimed he gained nothing from the oral speaking experiences, thirty-nine stated that with each succeeding talk they gained more and more control and could see decided self-improvement. Admittedly, this is a time-consuming activity, but both students and faculty feel it is well worth the time and effort. And so, in English III, at Ward Technical College, University of Hartford, we continue to move from paper to podium.

# MAKING TEAM PROJECTS WORK IN A TECHNICAL COMMUNICATION COURSE

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## INTRODUCTION

The use of team projects in technical communication courses is not new--in many courses oriented toward professional communication this kind of simulation of real-world activities is obviously attractive--but some discussion of their usefulness is called for. In this paper I offer my experience with team projects as an example, and on the basis of that experience I offer some general guidelines that might govern the use of team projects in the technical communication classroom.

Team projects may be large or small, may involve an entire semester's work on a large topic or a single class period on a limited exercise, but in general they have the same purposes. Having students perform in teams to produce presentations on subjects related to technical communication of course allows them to learn about communication. But in addition to the knowledge students gain of the individual subjects they investigate, they also acquire experience working in organizations, gathering information, writing and editing reports, and (in my course at least) giving oral presentations, all of which are necessary in the jobs students get when they graduate. In larger projects they also learn about scheduling, budgeting, working under deadline pressure, and coordination of effort. Furthermore, one of the chief benefits of this approach to the teaching of technical communication is the genuine enthusiasm and the high level of professionalism exhibited by the students. This positive attitude toward the projects spills over into their other work in the course and makes the entire learning experience much more profitable (and enjoyable) for them.

## PROCEDURE: AN EXAMPLE

The team projects I have used are somewhere in between the semester-long project and the class-long exercise, and for that reason may provide an interesting point of departure for our discussion. I had my students investigate and present written and twenty-minute oral reports on topics central to technical communication (some sample topics were résumés, job interviewing, audience and purpose in reports, organizing reports, visual aids in oral and written reports, oral reports, editing, etc.). A vital part of each presentation was a self-contained transparency, slide or videotape show to accompany the oral and written reports. I took this approach for two reasons. First, my students come from a wide variety of technical fields and therefore share little in common other than their work in my course. Second, I needed additional visual aids materials to use in the classroom; by having my students prepare professional visual aids on the topic they were presenting, I encouraged them to learn how to make visual aids and I acquired a large library of useful materials.

I divided my students into groups of four and assigned specific topics for them to investigate. I chose the groups by lot to discourage cliques and to simulate real-world working conditions (employees do not always get to choose their co-workers). I left responsibility for group organization, scheduling, and method of presentation entirely to the students. Some devised rigid hierarchies and others operated more or less democratically. I gave each team about six weeks to complete their task. I obtained brief oral progress reports about halfway through the project, and spent some class time discussing the obstacles faced by all teams, but in general this kind of assignment need not keep one from the other business of the course. I found that most of the discussion about this assignment took place out of class, and that one of the benefits of the projects was that I got to know my students much better. They also came to feel a sense of identity with the course because of their group efforts to meet shared goals.

## MATERIALS AND FUNDING

Materials for the projects (transparency film and frames, slide film and developing, videotape, etc.) were paid for out of a small grant I obtained from North Carolina State.

## EVALUATION

Team project reports were evaluated in several ways. I graded the written, oral, and visual aids components of the reports, of course, but I also asked the class as a whole to evaluate the reports of each team. In addition, I asked all members of each team to evaluate their own performances and those of their teammates. I felt peer evaluation was necessary to get an accurate picture of the success of the visual aids presentations (which after all were designed to be used to teach future students). In addition, the self-evaluation of the team members allowed them to discuss frankly the relative diligence of their fellow teammates. This last aspect of the evaluation process was particularly useful because of the team-oriented nature of the projects. To instill a sense of responsibility and cooperation in the teams, I announced at the beginning of the exercise that all members of a team would receive the same grade. As a consequence, when teams found some members were working harder than others, they had to decide as a group whether to cooperate, take over the job of a non-participating member, or suffer the consequences of a poor or uneven presentation. In this self-evaluation at the end of the projects, team members were encouraged to analyze the results of their efforts at interaction and to discuss any lessons they had learned from the process.

## RESULTS

The results of these projects were excellent. I received some fine reports, and I still use the visual aids produced in these projects in my classes. Furthermore, my students, in their evaluations of the exercise itself, indicated an overwhelmingly favorable response to the experience. Almost all claimed to have gained both knowledge of some aspect of technical communications and understanding of the importance of group effort and cooperation (which is of course the foundation of most successful professional activities). Significantly, almost all students indicated that the 20 to 50 extra hours they had put into the projects had been worth it, and that they would recommend the repetition of these projects in future semesters.

Assigning team projects is not without its problems, of course. The logistics of administering money and materials is often time consuming, and the inevitable obstacles to group harmony and efficiency are often aggravating, but I strongly feel that these problems are just the sort of things that our students ought to have to encounter and overcome in their technical communication courses. We are not just in the business of teaching people how to write letters or reports, but how to communicate in the broadest sense. If we can make the reports our students present truly useful, truly instrumental, then we teach them why it is important to be able to communicate as well as how to do it.

GUIDELINES

On the basis of my experience with team projects, let me offer some brief guidelines that might govern their use in the technical communication classroom.

The size of team projects can vary. Anything from a single class period devoted to evaluating student reports to semester-long projects that encompass the entire course and all its assignments can be appropriate. I don't mention specific topics because teachers must evaluate individual circumstances and goals before they decide on topics, scope, and approaches. What is more important than the kind or scope of the topics, it seems to me, is the interaction, the dialogue between students and the "real world."

To that end, let me suggest that the crucial factor in assigning team projects is the encouragement of student responsibility. An assignment which gives students clear goals (in terms of products or results) and then "turns them loose" to achieve these goals in any way they see fit will (sometimes astonishingly) promote--and reward--student initiative, ingenuity, and professionalism. As they face the decision-making process, they are brought face to face also with the same kind of obstacles and rewards they encounter in their communication on the job. Students have the opportunity to succeed or to fail--and the results are entirely under their control. What students learn from this responsibility is often vital to their success as professionals.

As for the teacher's role in this process, let me suggest that helpful but unobtrusive guidance works best. Let students work out their own problems--within teams, or in relation to the topics themselves. Of course it is occasionally necessary to offer counsel, but by and large the problems your students encounter are just the things which will help them to learn. You must make sure that the assignment is sharply defined and that the topics are worthwhile, and you must allow your students enough time to complete the assignment, but beyond that, your students should run the show.

Finally, let me suggest that peer evaluation is crucial to the success of most team projects. If you want your students to act professionally, you must treat them as professionals. Their opinion of their classmates' success is valuable--and valid.

## CONCLUSION

Team projects may not fit into every technical communication course, especially not on the level that I use them, but the effort required to devise, fund, and direct them is repaid many times over by the enthusiasm and learning of your students. As a means of simulating professional communication activity they are one of the most potent weapons in the technical communication teacher's arsenal.

Panel D-20

# Research in Business and Technical Writing: Three Empirical Studies

# SHARED RESPONSIBILITY:

# TEACHING TECHNICAL WRITING IN THE UNIVERSITY

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Writing teachers are throwing up the barricades. Behind piles of books hastily pulled off library shelves, one side shouts that English teachers can and must teach technical writing. (See "Notes from the Besieged or Why English Teachers Should Teach Technical Writing" by Keith N. Hull, CE, 41 [April 1980].) Behind an opposing barrier, formed of computer printouts and blueprints, the engineering educators are marshalling arguments. (See "Technical Communication: The Engineering Educator's Responsibility" by J. C. Mathes, D. W. Stevenson, and Peter Klaver, Engineering Education, 69 [January 1979].) At stake is a considerable prize, one that might ensure a good living for teachers as the writing boom roars on--the training of technical writers. The last twenty years of this century and the foreseeable beginning of the next will produce a geometric expansion in the amount of writing generated by technology, research, and government. Never mind how it will be disseminated, by word-processor, interactive computers, and/or satellites. It all has to be written first and someone must train the writers.

Stepping between the barricades, I'd like to call a halt and suggest that before we fight, we'd better know what we're arguing about. At least let's stop long enough to examine the functions and genres of technical writing, define boundaries, and apportion spheres of influence. Combative energies might then be deflected into a cooperative assault on the real enemy, writing ill adapted to its readers' needs.

Both combatants and spectators are confused by the inexact terminology in the field. "Technical writing" has too many vague overlapping meanings, not only because definition is hard but also because the groups using the expression do not communicate easily or habitually. Communication requires more than a disciplinary overview--it requires those inside the academy to investigate how writing is used in situations they normally do not encounter. In my argument, I have subdivided technical writing according to purpose audience, and essential features, trying to lay out territory where English teachers have a legitimate claim to expertise and where they should cooperate (even as junior partners) with educators from other disciplines. Taxonomy demonstrates that we don't have a simple case here. We can't categorically declare that the English department should teach technical writing, or that it shouldn't. It can teach technical writing most effectively where English teachers can act as a surrogate audience; where professionals in the discipline concerned form the intended audience, the English teacher's role is severely limited. We're talking about a compromise, cooperation instead of competition. Consequently, a well-designed technical writing program should have an interdepartmental base, for writing is everyone's responsibility and no one's exclusive domain.

I.

We may agree, I hope, on a fairly broad division of writing to begin with. Literary writing, belles-lettres, differs from practical writing mainly in social function, for all other definitions fail.[1] Practical writing earns its living, literature entertains. To appreciate the truth of this distinction, reflect that both reading and writing literature are personal choices, but you can't choose when faced with a memo, a report, a proposal. Practical writing is part of the job. So we can construct a table from this first dichotomy:

TABLE 1

PRACTICAL WRITING AND LITERARY WRITING

| Practical writing | Belles-lettres |
|---|---|
| business writing, secretarial | novels |
| business writing, administrative | plays |
| student papers | poetry |
| technical writing: | literary essays (including scholarly articles) |
| technical writing as advertised | scripts for radio, TV, and movies |
| journal articles | |
| instructions | |
| formal documents | |
| writing for decisionmakers | |
| legal briefs, memos, and decisions | |

In this table, I have deliberately not included journalism, advertising, and public relations. I have an easy cop-out--these types of writing are usually not taught by the English department, but are considered "communications," so they aren't in dispute here. But there is a more interesting reason. Journalism and its subgenres occupy a grey area between literature and practical writing. They have work to do, but can't do it without entertaining. They are part of a job, but the job is the writer's rather than the reader's. A reader can choose whether to read journalism (or advertising) despite its manipulative efforts to replace choice with compulsion.

I have grouped the subgenres of practical writing in order to reveal the attitudes which provoke disagreement. Business writing is divided into two kinds, so that we do not confuse secretarial conventions (letter form, etc.) with substance. This confusion underlies the contemptuous dismissal of business writing as unworthy of inclusion in a university curriculum. A businessman, however, must read and write memos, reports, proposals, letters where the content may be so delicate that the writing takes weeks of polishing and revision.

Student papers are clearly practical writing. They would have no existence apart from the jobs of learning and teaching. But they also permit an important distinction. Student papers transmit information from those who don't know (students) to those who do (professors and teachers). The writing doesn't add to the recipient's store of knowledge or increase his ability to perform his job. On the other hand, the writing grouped under "technical writing" provides information essential to the reader.

I'd like to postulate this as a definition of technical writing: it is the communication of information the recipient needs to perform a task. Such a definition should satisfy all contending parties, because it is at once narrow enough to focus on essential features and broad enough for there to be no question that English teachers can understand and teach its rhetoric. The definition centralizes purpose and audience rather than specific subject matter. Definitions of technical writing tend to focus on disciplines: e.g., "technical writing, that is, the transmission of specialized scientific and technological data to readers" (Siegfried Mandel, Writing for Science and Technology [New York: Dell, 1970]). Limiting it thus excludes material like the instructions for completing tax returns--surely technical writing. The definition does not specify forms, because reports, memos, proposals, "papers," articles, catalogs are not confined to any single genre of practical writing.

But the subgenres are a strange assortment. Journal articles in the same class as policy analysis and legal writing? I have grouped them thus to dramatize the confusion surrounding technical writing. Articles of all types listed have been shielded from my scrutiny with some version of this claim: "Ah, but this is technical writing--you wouldn't understand what I'm saying." At the same time, a person describing himself as a technical writer would expect to write "technical writing as advertised" and instructions. He would not think of himself as a legal writer or a writer of policy analysis, much less of articles in scholarly journals. What we have here is really a subset of practical writing more accurately called "task-oriented practical writing." Such a renaming would confine "technical writing" to its use as a job description.

The following taxonomy attempts to make some sense out of the confusion. By subdividing according to audience, parameter, and importance of rhetoric, the classification focuses on the function of each kind of writing within a context. It permits a clearer understanding of the comparative contributions a discipline instructor and an English teacher could make to the acquisition of skill in task-oriented writing.

In the table below, "parameter" (in its strict sense, not a synonym for "perimeter") means the essential core of the writing, its raison d'être to which all its features refer. "Audience" is self-explanatory. "Rhetoric" indicates the scope of choice in the writing. Can this information be transmitted in more than one way, or must it follow a strict formula? Finally, "motivation for polished writing" indicates how much regard the writer would be likely to receive for investing time in refining his prose.

The table schematizes three subclasses of technical writing, in order of the increasing ability of English teachers to teach them. I'll present the table first, and then discuss each subclass separately.

TABLE 2

THREE SUBCLASSES OF TECHNICAL WRITING

Subclass 1
Technical writing as advertised; journal articles

parameter: fidelity to described object or process
audience: peer users, customers, colleagues
rhetoric (i.e., scope of choice): absent--language a necessary nuisance
motivation for polished writing: absent

Subclass 2
Instructions; "how to" writing; formal documents

parameter: reader's ability to perform operation
audience: nonpeer users and customers
rhetoric (i.e., scope of choice): present to the degree it serves usability
motivation for polished writing: conditionally present

Subclass 3
Writing for decisionmakers; legal briefs, memos and decisions

parameter: reader's understanding of the problem, the solution (if any), the possibilities, the caveats
audience: decisionmakers, equal in education level, but not sharing specialty
rhetoric (scope of choice): omnipresent
motivation for polished writing: strong

## SUBCLASS 1. TECHNICAL WRITING AS ADVERTISING; JOURNAL ARTICLES

I wish there were a term less unwieldy than "technical writing as advertised," but unfortunately all the precision is needed. This is the technical writing which I believe English teachers cannot teach unaided. It is the technical writing usually associated with the engineering department. It is what springs to mind when someone describes himself as a technical writer--a person who translates blueprints and specifications into words. Despite the fact that its name has become that of the whole category, this kind of technical writing is a single narrow subclass of information transmittal.

"As advertised" specifies that this is the technical writing commonly understood. Here are some advertisements for technical writing positions which appeared during August 1980 in the Los Angeles Times:

> Procedures Writer: Leading relay manufacturing company has challenging opportunity for an experienced Procedures Writer. Good writing skills needed to document various department procedures. Will have responsibility for company forms control.

We're looking for several technical publications writers in command, control and communications systems. . . . Since we will be providing over 700 technical manuals at system, equipment and depot levels for prime and test equipment, we need to talk to you now. So if you have experience and expertise in technical manual preparation and related support functions and/or technical familiarity with electronic systems and support equipment send us your resume and salary history today. And remember, when you start on the ground floor of a n. division, there's usually only one way you can go. Up.

Tandon Magnetics of Chatsworth is seeking a Technical Writer who can extract and compile technical data and write/revise text for product and parts catalog, service manuals. Technical or trade school training desirable, plus a minimum of 2 years' experience in related fields.

American Honda . . . specifically we're looking for an individual with 2 years of technical writing experience, including familiarity with layout concepts and publications production plus 2 years of college. Also, because much of our writing requires hands-on validation, practical experience with automobile, motorcycle or small engine repair--including understanding of motor vehicle electrical systems--would be a definite plus.

RCA Avionics systems has an immediate need for an Engineering Writer. The individual we seek will prepare circuit descriptions as well as instructions for digital avionics equipment. Must be able to work directly from logic and schematic diagrams and from engineering test specifications.

If we English teachers claim that we train technical writers, then a student leaving our classes should be able to apply for such a job, on whatever level he or she graduates. But there is no way, unaided by technical personnel, that we could train such a person, because we have no criteria by which to judge writing in that context.

In the communicative ecosystem of technical writing as advertised, the first necessity is fidelity to the original facts, usually embodied in engineering diagrams, chemical formulae or similar technical specifications. There is no room for rhetorical organization of any sort, because the presentational order is dictated by the technical process. The steps must be written in a sequence which will allow the user immediate access to the object.

There is also no need to eschew jargon, if we understand the word to mean diction adapted to a particular field or subfield. The audience for this kind of writing understands the jargon and the acronyms. In fact, if the writer did not use them, readers would suspect that he didn't know what he was talking about. They would not trust his expertise. The readers are users of the object or process described. They share with the writer a common background and language. "Good writing" in this context means minimum obstruction between the reader and the described object. It is a window. Much of this writing is documentation--assembling information into a unified repository.

The information would be just as easily understood in the original drawings and specifications, but these are unwieldy, dispersed, and not easily reproduced.

As the advertisements show, a technical writer commonly works from specifications to prepare instruction manuals. Computer hardware manufacturers, for example, employ writers to document every detail of a machine (or its derivatives, since new ones evolve from old) so that users will be able to consult a manual for installation, service, and operation. But these are not the instructions of subclass 2. The users are trained comparably to the designers of the machine. They want to know which design options have been chosen, but do not need explanations.

What could an English teacher do alone to prepare such a writer? He could make sure a student has a sound grammatical grasp of the language, although elaborate syntax will not be needed. Mechanical perfection in the language is not to be despised, for the "good writing skills" mentioned in the advertisements mean spelling, sentence construction and punctuation. (Technicians have an exaggerated respect for anyone who, like Holden Caulfield, can put the commas in the right places.) He can sensitize technical writers to redundancy: "in the vicinity of" means "near," "it is supportive of" means "supports," and "adequate number of" means "enough." And so on. (Style manuals for specialized journals now list a thousand such phrases, which may have a dual origin, in the desire for inflated dignity and in students' resorting to formulas to fill up required pages.) A teacher can make technical writers aware of the metaphorical history of words like "glean" and the ever-present "focus." Such awareness contributes to the linguistic consciousness users of language need--a good workman understands his tools. And results from psycholinguistic research demonstrating the theme-rheme progression of English sentences can help writers to place their emphatic material where it will get most attention.

But for technical writing as advertised, English teachers really can't do much more. They can't teach paragraph structure, because paragraphs are mandated by the way the diagram breaks up into components. They can't reorganize a description which must follow a process in time. They can't replace jargon with synonyms. Above all, they can't judge whether the writing is correct, for logic alone is not an adequate tool for understanding. Without assistance from technical experts, an English teacher cannot judge the essence of technical writing as advertised--substantive accuracy.

The matters which the English teacher can work on are peripheral to that central purpose. A technical editor who took my editing class at UCLA told me he was glad that he has learned to use the Chicago Manual of Style and had enjoyed Strunk and White, but he wouldn't be able to use the information much in his work. If the material was accurate, he said, he was not authorized to change it no matter how miserable the expression. An editor at the American Chemical Society told me the organization does not employ writers as such: "It's much easier to train a chemist to write reasonably than it is to teach a writer enough chemistry to understand what he's writing about."

Fidelity to substantive accuracy leads me to designate journal articles as subclass 1 technical writing. Journal articles in all fields--it wouldn't be stretching things too much to include literary criticism--address a tiny specialized audience, which has specific needs and understands the jargon. In the case of physical and social science journals, the majority of articles report experimental research. Like the technical writing which interprets blueprints, these reports must reproduce a process clearly and unambiguously. They follow a rigid and nonrhetorical prescribed order: summary or abstract, introduction, method, results, discussion, appendices. The order is so nonfunctional in one sense that experienced readers of these journals read the abstract, skim the methods, and go directly to the discussion. But in another sense, the order serves an important purpose, not apparent to those outside experimental fields: peers can verify every step of a procedure if the process is thus laid out systematically. The rigidity of the order suppresses any possible distraction an artful presentation might entail. Rhetoric is not welcome here. An article must be accepted or rejected on the strength of the work reported. "Improving" the writing of a scientist whose reputation depends on frequent publication in such journals could handicap his career.

We cannot leave this description of subclass 1 writing without stressing again the narrowness of its focus. Few beyond the targeted audience will read it. As I mentioned before, this subclass is not confined to a discipline or a genre, despite its common association with engineering. A doctor writes subclass 1 technical writing when he communicates with his colleagues, discussing cases and therapy. To the patient he writes subclass 2 and subclass 3 to the hospital administrator or to a state legislator. A lawyer reporting to his firm's senior partner after researching cases writes subclass 1. So does an economist describing a new econometric equation. The English teacher's help can make such writing crisp, nonredundant, grammatically and syntactically accurate. Ideally, technological and scientific training would include at least one course in subclass 1 writing taught jointly by a subject instructor and an English teacher.

## SUBCLASS 2. INSTRUCTIONS; "HOW TO" WRITING; FORMAL DOCUMENTS

Subclass 2 technical writing explains. Technical writing courses in English departments chiefly teach this kind of writing. It describes an object or process in terms which the nonexpert can understand. Thus it differs from subclass 1 writing, where both writer and reader shared expertise. The user (reader) must be able to follow the explanation for his own purposes. The reader's needs are paramount. The writing will be successful insofar as it accommodates them.

Good instructions--which we can generalize to usable information--are extremely difficult to write because they must be entirely nonambiguous. They require the writer to identify with the reader, assuming ignorance and anticipating all the comprehension problems a reader faces.

Instructions and information are also ubiquitous. They are supplied by the government--how to fill out forms, where to get what services; by the research community, when it devises evaluation instruments, for example, which will be used on the job by social workers or administrators; by industry, for installation and service of its products. (Some examples are very good. Even an unsophisticated mechanic can follow the instructions supplied in the Clymer series of handbooks for different makes of automobile.)

The writer of instructions or information must know his product or procedure as well as the technician. But he must also act as a bridge between that knowledge and the potential consumer. Rhetorical training provides the framework for the bridge. First of all, the audience for instructions usually needs more context than the expert would require. Before the explanation gets down to detail, there must be an initial high-level explanation to give the novice reasons for the required action, a context for it, and the constraints on it. This explanation would irritate the consumers of subclass 1 writing, who don't want any elementary scene-setting. The audience-sensitivity necessary in instruction writing would impede subclass 1 writing, where the relationship is primarily between written message and original artifact, not between material and reader. Second, good instructions should not use jargon. If they do, it should be jargon explained and consciously used as shorthand. Third, instructions need reliable terminology and repetition. The same object should always have the same name, no matter how many times it occurs in the same paragraph. Not only must identical terms be repeated, but repetition of whole phrases and sentences may be necessary. Such repetition assuages the insecurity of the nonspecialist user. Criteria for successful subclass 2 writing are its substantive accuracy (fidelity to the object) and the reader's ability to make use of the information, not merely to understand it. Rhetoric is essential, but unobtrusive. The writer must be conscious of manipulation, not the reader.

The English teacher has an obvious role as surrogate audience. He can monitor the reader's end of the process, although still trusting to technical experts for the accuracy of the front end. His task is also made easier in this kind of writing because students can easily check each other's efforts. If one student can accurately follow instructions written by another (especially in a different branch of technology or a different discipline), then the first student has performed well. But if he produces a raven instead of a writing desk, then the teacher doesn't have to justify a low grade.

SUBCLASS 3. WRITING FOR DECISIONMAKERS; LEGAL BRIEFS, MEMOS, AND OPINIONS

Writing for decisionmakers communicates specialized knowledge to administrators who need the information to make informed decisions. Like the readers and writers of subclass 1, specialist researchers and administrators are peers--but in educational level, not discipline. (Researchers are often told to write "to Ph.D.'s in another subject.") Like the readers of subclass 2 writing, the administrators need to use the information, although abstractly. They aren't making bicycles, but policy.

Here is where the rhetorically trained writing teacher can offer most assistance. He can teach the specialist how to organize so that his writing will communicate to the decisionmaker precisely the degree of confidence to be placed in the results. Very few research questions have simple answers.

Most problems have partial solutions, acceptable only under multiple conditions. A nonspecialist administrator risks oversimplifying a complicated answer to the problem; he may not understand the conditions where the partial solution applies. As the ideal surrogate reader, the nonspecialist writing teacher trains the expert to explain with fidelity to the research findings and to the reader's needs. Frequently, the results of analysis can be communicated thus: if you want result A, choose path A; if you want result B, choose path B. Neither A nor B may be what the administrator originally envisioned, but they may be the only feasible options. The researcher cannot recommend either A or B. He can only make clear how either could be accomplished and the probable consequences of choice.

In February last year, the Congressional Budget Office in Washington, D.C., was asked to analyze ways of reducing the Federal Budget. The resulting publication, Reducing the Federal Budget: Strategies and Examples (CBO Background Paper, February 1980, U.S. Government Printing Office, Washington, D.C., 20402), brilliantly exemplifies effective writing for decisionmakers. The audience for the paper, the legislators on Capitol Hill, lacks the technical economic information needed to understand the calculations involved in budget projection. On the other hand, the trained economists at CBO understand the means and the probable results, but cannot usurp the legislators' duty to choose a course of action. The publication therefore lays out first five possible strategies: management efficiencies, better targeting, shifting responsibility to state and local governments, shifting responsibility to the private sector, and revising judgment as to what can be afforded. Then it follows the exposition of each strategy with a series of examples--each displayed on a separate page--where the potential savings are set out in a table and then briefly discussed. Deliberately, the discussion includes the pros and cons of the strategy in this particular case. Here is an example (chosen partly for its brevity):

Elimination of Operating and Construction Subsidies for the Maritime Industry

| Savings by Fiscal Year (in millions of dollars) | | | | | Cumulative Five-Year Savings |
|---|---|---|---|---|---|
| 1981 | 1982 | 1983 | 1984 | 1985 | |
| 130 | 160 | 189 | 221 | 254 | 954 |

The Maritime Administration pays a construction cost differential subsidy to U.S. shipyards so that they can meet the competition of foreign shipbuilders. It also pays operating cost differential subsidies to U.S. shipping companies, again for the purpose of meeting competition from foreign countries. If the two subsidy programs were ended, the savings in the first five years would approach $1 billion. Because the operating differential subsidy is a contractual obligation with respect to a particular ship, and typically for 20 years, it would take about that long to capture all the savings this option would generate.

The argument for such a step is that only three or four ships a year are built with the construction subsidy, so that the program has minimal effects in maintaining shipbuilding capacity.

If the subsidies were ended, there would be some loss of emergency naval shipbuilding capacity, some possible adverse effects on U.S. export and import prices, and some loss of employment in shipbuilding regions and in the industries that furnish shipbuilding materials.

A further chapter of the paper explains possible savings on the revenue side, by reducing tax subsidies and tightening up enforcement of existing laws. A summary table by budget function closes the volume.

A legislator can use this material. It was designed to make his decisionmaking well informed, if not easier. It presents the result of analysis with fidelity to the subject and its enormous complications, but without allowing these complications to make the communication itself inaccessible. Reducing the Federal Budget: Strategies and Examples resembles the top one-tenth of the iceberg, as good decisionmaking writing should. It rests on a solid substratum of intense analysis both by computer and by hand. But it does not thrust that analysis before the reader and confuse him.

When writing for decisionmakers, a researcher must reduce his specialized knowledge to a point where it can be judged by logic alone. Both highly intelligent and well educated, the reader and writer share an ability to reason, but not the capacity to understand multiple regression or the role of empirical Bayes estimators. Naturally, the necessity of explaining in logical terms alone strains the rhetorical skills of researchers. In graduate school, their models were journal articles. They are ex-subclass 1 writers, who must now expand their jargon, explain methods, and reorder their communications for a different audience. Credibility is a major issue in journal articles--hence the review of relevant research ritualistically included. But administrators and legislators wouldn't be impressed by the most extensive knowledge. They trust the experts because they are employed by the Congressional Budget Office, or the Office of Technology Assessment, or the Rand Corporation. Decisionmakers need the shortest possible explanation of research results, stripped of all except the essential qualifications. They need what they can use.

So do consumers of legal writing. Recent "plain English" statutes have reinforced a drive towards demystified legal writing begun by David Mellinkoff (The Language of the Law, 1963) and Richard C. Wydick (Plain English for Lawyers, 1979). Like researchers, lawyers are reluctant to recognize that they are writing for decisionmakers. One cannot really blame them. Trained to respect extensive documentation and to display their credentials for inclusion in an elite group, they find it difficult to write directly and--as they see it--reductively.

In addition, decisionmaker writing is difficult and time-consuming. Arnold J. Meltsner writes: "Analysts will have to improve their understanding of rhetoric and the psychology of communication. They will also have to accept the necessity of spending as much time on communication as they do on the analysis itself" (Pitfalls of Analysis, ed. Giandomenico Majone and Edward S. Quade, p. 136). In rhetoric and the psychology of communication, the English teacher is an expert.

II.

How can this taxonomy assist in curriculum design for technical writing (or, as I would prefer, task-oriented practical writing)? It guides the degree of cooperation between teachers of the discipline and teachers of writing. Applying the taxonomy, we can lay out some principles for comprehensive programs incorporating all three subclasses. What follows is not intended to be a practical, financed layout ready for the Schedule of Classes. You may reasonably object that it's a long way from even the proposal stage. But it provides some parameters for brainstorming.

Before principles, a stipulation and a consideration.

Let us stipulate that the writing courses we are discussing supplement, not replace, the regular English department composition course. English department instruction may have all the vices claimed against it by Mathes, Stevenson, and Klaver ("If engineering educators . . . send engineering students to English departments to learn technical communication, they risk having their students taught principles that are in conflict with engineering principles," p. 332), and all the virtues claimed for it by Keith Hull ("Ambiguity is bad in technical writing, yes, but a heightened awareness of the meanings of words, of the deep resources of the language, is the technical writer's surest guide to clarity and economy. Any writer trained only in language that can have but one meaning will be . . . totally inadequate to the range of writing challenges likely to be encountered in a professional career," p. 879). In this paper I have tried to dovetail these views, not exclude either one. For compromise here is what we're after--what the extradepartmental colleague can't teach, the English teacher can, and vice versa. But there's another reason for supplementing rather than replacing the freshman writing course: it provides many students their only experience of literary values and the literary essay. The ideal writing program for the technological and scientific major should include the English department's literature-based writing course and build from there.

And here's the important consideration: the students who most often need practical writing instruction will frequently need help with English as Second Language. (In fact, the U.S. is becoming so polyglot, especially in large urban centers, that ESL and composition teaching may become indistinguishable within the critical next twenty years.) So in our ideal program, we should anticipate the need for additional tutoring for some students, perhaps even complete sections taught by ESL specialists.

The program has to train at least two kinds of writers, and maybe more. It must train those who want to become technical writers and those who will primarily be technologists or scientists. Although what these specialists write will not be technical writing as advertised, they will spend much more of their careers writing than they think. In an article in Engineering Education, January 1979, M. E. Leesley and M. L. Williams write:

> We tell freshmen that in their first few months of work they will spend about 30 percent of their time doing engineering and 70 percent of their time writing about it. Soon the ratio will be 20/80 and thereafter will slowly dwindle to 0/100, except in unusual circumstances. They don't believe us, of course, not at first anyway. (One student told of how he went home and, incredulously, repeated our words to his father. His father, a nationally known chemical engineer, said, reflectively, that it was true; furthermore, he said that the engineering c ntent of what he wrote had also dwindled.) (pp. 338-39)

The amount of writing involved in a technical or scientific career shocks students who may have deliberately chosen the field because they preferred not to write. Surprisingly, despite pressure to publish, faculty sometimes reinforce the students' prejudice rather than breaking it down. I have heard psychology faculty members scorn the ne for writing--"it's obsolete"--and engineering faculty relegate writing to the triviality or a frill.

From the need to provide a flexible program, then, arises our first principle: all three subclasses of practical writing should be taught at the undergraduate and graduate levels. Technical writers need a course taught jointly by discipline and writing instructors. The same kind of instructional pattern should underlie the writing of theses, dissertations, and journal articles. These are subclass 1 writing because they are essentially of the same genre as journal articles, addressed to a narrow audience of comparably trained peers. Thus an English teacher could routinely meet with dissertation students, not as a member of the committee but as part of a dissertation seminar. (The logistics of such an arrangement are no more forbidding than any interdisciplinary cooperation, since one English teacher could work with number of dissertation students in several disciplines simultaneously.)

Subclass 2 and 3 writing can be taught by English instructors alone, although ideally subclass 2 writing would be taught as an adjunct, this time with the discipline instructor as junior partner. The difference between undergraduate and graduate instruction would depend on level of material and intended career. An undergraduate training for a technical writing career would need to know how to write instructions and how to write for administrators about products and services. A graduate contemplating a career in research must learn to write policy analysis.

Perhaps the idea of writing classes at the graduate level seems incongruous, even demeaning. However, we are not talking about remediation, but about training for kinds of writing formerly not acknowledged. Research institutions, as well as government departments and industry, try to meet the need by offering their employees in-house training. Law schools now have English departments. Despite instructors' expertise, such courses are patch-up jobs at best, for the university is the place where such skills should have been practiced.

So we have a program where at least six courses (or forms of instruction) are offered. We can arrange them on a spectrum: at one end, subclass 1 writing, the courses are primarily discipline-oriented, with writing instruction adjoined; at the other, subclass 3, they are writing-oriented. In the middle, subclass 2, the courses are writing-oriented, but need disciplinary monitoring, perhaps by the students themselves as they check each other's accuracy.

Now comes the second principle, an obvious corollary: practical writing instruction belongs in no single departme t. Behind the claims for expertis which began this paper may lie a fear of institutional complications--if instruction is located in a single department, things are much simpler. True interdisciplinary teaching requires an extradepartmental unit which will mediate academic credit, faculty assignments, and scheduling. At UCLA, such a unit has been established as UCLA Writing Programs, under the directorship of Professor Richard A. Lanham. Funded by Executive Vice-Chancellor William D. Schaefer, formerly Executive Director of the Modern Language Association, UCLA Writing Programs is an anomalous unit loosely connected to the English department but with its own staff, lecturers, and physical location. It responds to expressed needs for writing instruction of precisely the kind we are discussing--help at the graduate level with dissertations and policy analysis, at the undergraduate level with component and adjunct writing courses attached to courses scheduled in other departments. It suffers the problems of detachment from a regular academic department, for its teaching staff are hired annually and are neither faculty nor administrative personnel. Its financial status is not institutionalized. Thus, it exemplifies both the risk and the opportunity of an interdisciplinary solution to writing instruction in the university.

A final principle: practic l writing instruction should be attached to central, basic courses in the discipline. Sticking a writing segment into a course entitled "The Engineer's Social Responsibility" (no course so far as I know has such a title, although there are similar offerings) confirms the students' belief that writing is not taken seriously by the faculty and need not preoccupy them. Enlightened departments will arrange for students to take at least one mainstream course a year which includes writing during their final three years. At a minimum, a student should emerge with experience in each of the three subclasses.

A program based on these principles would have the virtues of a good treaty. It would end hostilities, promote futurue cooperation, and allow all parties to feel victorious. There are no losers when everyone--students, teachers, future employers--stand to gain.

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# TOWARD DEFINING "GOOD" WRITING: A RHETORICAL ANALYSIS OF THE WORDS, SENTENCES, AND PARAGRAPHS IN 16 INDUSTRIAL SCRIPTS

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## INTRODUCTION

The report on research which follows addresses a significant problem of technical and scientific writing and, in particular, of recent theory and practice in writing across the curriculum programs.[1] These programs and the theory which informs them have proceeded as if teachers of English and technical writing and teachers of writing in all disciplines agreed on a definition of "good" writing. However, in workshops offered to interdisciplinary faculty groups at Michigan Technological University it became obvious that we could reach no satisfactory agreement on a definition of good writing. In addition, no systematic research or study has attempted to define the features of writing which would go to make such a definition. English departments, and universities in general, have shown little or no interest in such an investigation and have proceeded to teach technical writing as if such information had no bearing on pedagogy or on a student's efforts to learn to write well for industrial and business audiences. Joseph Williams, lamenting this situation, notes " . . . we know next to nothing about the way individuals judge the quality of writing in places like Sears and General Motors and Quaker Oats. What counts as good writing at Exxon? . . . It is the obligation of universities to support the research that would tell us, so that we would know what to teach . . . and yet virtually no such research exists."[2] Our intention in undertaking this research was to move toward forming such a definition.

We wanted to know, or at least to begin to answer, the following: What constitutes good writing in the real world? What kind of writing will students actually do after they leave the university? To what extent are the features of this real-world writing determined by aim, mode, and audience? Does the English teacher's definition of good writing, as indicated by textbook maxims, have any substantial connection to the writing students will be expected to produce in industry and business? Does current pedagogy actually prepare students to write as they will have to outside of the English class? In asking these questions we are aware of a number of problems associated with beginning such research. First, this research must initially identify a wide range of features from writing considered good by readers in industry and business. We begin then with an assumption that good writing is not exactly a product or object but, to some extent, a perception of a product. That is, readers define the quality or the success of a piece of writing. We embark, therefore, on research which initially derives from the observations of specific readers. While aware of the problems inherent in such research and particularly in the tentative kinds of conclusions which we can draw from it, we see no other way to start. The analysis of published writing in popular journals, e.g., Harper's, The Atlantic Monthly, The Saturday Review, has been extensively used by researchers like Kellogg Hunt and Richard Braddock, but for our purposes such sources are inappropriate. Analysis of student writing is not at all to the point, nor is analysis of process at this time. We have been concerned, in fact, that composition theory and pedagogy have shifted too much toward the composing process with a resultant neglect of the product. Knowledge of the process of writing will not, by itself, enable students to write better products since the process itself may be determined by the form the product must assume. This is especially true in industry and business where formats and textual features are often fairly rigid. In addition, most theories of process include among the stages of the process frequent stages of revision. When revising, a writer must make corrections or additions to his work. Whatever name we give to a writer's sense of completion we assume that the writer must know when he has arrived at some closure (even if only at a point where he wishes to submit the writing to another reader). This requires that the writer has the ability to read his work. Students must understand what constitutes a successful piece of work across a variety of disciplines, in business, and in the general world of work. The most economical way to do this is to examine what passes for good and successful writing in a field and then to go through the processes which produce similar writing. At every revision, however, the student must be able to read his own and his peers' work with a consciousness of the important features required.

Our concern is to begin to identify those features of technical/industrial writing which appear consistently across a variety of written modes and which professional writers use for a variety of purposes. The analysis of any single feature for statistical reliability and validity remains, we are aware, for future follow-up research.

The central purpose of our work is to develop a wide-ranging list of features. Our study depends on the analytic tools generally associated with literary research--close reading and careful textual analysis. Any such research suffers from certain subjective limitations. For example, reading a paragraph and deriving the topic sentence depends on what a reader considers to be the thesis of the paragraph and of the whole discourse. We usually agreed about such matters, but, on a significant number of occasions, we disagreed. Such disagreements had to be resolved through re-reading and discussion (future researchers might well wish to work with a number of trained readers, a luxury we could not afford). Indeed, once we were past the analysis of features which we could easily count or define (the limits of a sentence, subordinate clauses, T-units, passive or active voice) we found it much more difficult to come to exact agreements. This fact perhaps sheds some light on the subjective nature of the reading process, even of technical discourse. Certainly it explains the hesitancy of many empirically trained researchers to tackle the problem.

## METHODOLOGY

Because we required writing identified as good by industry and business readers our first task was to collect samples from them. We requested samples from a variety of industrial sources, e.g., IBM, ALCOA, Exxon, Weyerhaeuser, Bell Labs, Underwriters Laboratories, Dow Chemical, U.S. Steel, Onan Corporation, and others. We tried to identify writers within the industry or business, that is, individuals specifically involved with producing or reviewing writing done in the work place. They ranged from members of technical writing departments to superintendents of divisions within corporations. We asked for writing which "would serve as a model for incoming or present employees--the kind of writing you want done in your office or corporation." We requested that the samples fall into two broad categories: writing which primarily informed and writing which primarily persuaded. Within those categories we requested writing directed at two audiences: a specialist audience and a lay audience. We received 57 pieces of writing from industrial/corporate sources. This paper reports on the analysis of 16 complete pieces of discourse--four samples from each possible category (a piece to inform a lay audience, a piece to inform a specialist audience, a piece to persuade a lay audience, a piece to persuade a specialist audience).

While we collected our samples, we designed analysis sheets for each of the five levels we intended to study: 1) word level 2) sentence level 3) paragraph level 4) discourse level 5) readability. At each level we had to decide what features we wanted to examine and whether or not each feature could be quantified. At the word level, for example, it was easy to establish percentages of monosyllabic and polysyllabic words; it was impossible, however, to count specialized words with absolute precision because of the subjectivity or relativity inherent in the concept "specialized." Similarly, at the paragraph level it was easy enough to count words and paragraphs per discourse, but it was much more difficult to tabulate methods of organization and development. In designing these analysis sheets, we also had to establish consistent procedures for examining each text since we would read the text separately. We had to decide how much of each sample actually to study and how to locate those passages within the overall discourse. These early decisions, along with some trial readings, resulted in a fairly tight and consistent analysis of scripts. For the present report we have completed analysis of the first three categories. This includes, at the word level, amount of syllabism, verb selection, nominalizations, and vocabulary choices. At the sentence level we counted T-units, measured sentence length, clause length, and degree of subordination, and determined syntactic order. On the paragraph level we examined patterns, methods of development, frequency and placement of topic sentence, propositional hierarchy, and the use of transitions.

## WORD LEVEL

Considering the limitations set out above, we offer these conclusions and comments. Since the work of Herbert Spencer, handbooks and textbooks on composition have urged the use of the shortest possible words and sentences; such advice has taken a number of forms which correspond to this maxim--use concrete, specific terms, familiar to your readers. As interest in the readability of text has increased, textbooks have begun to say the same thing to a slightly different purpose. For instance, Houp and Pearsall in their technical writing text Reporting Technical Information say " . . . the use of shorter words and shorter sentences correlates positively with ease in reading . . ."[3]

As Figure 1 (below) shows, the writers of our samples (and the readers who selected the samples) paid little attention to the maxim to use shorter words. Instead, the samples showed writers using familiar words or repeating words. The industrial writers we surveyed used polysyllabism or high density words twenty percent of the time.

Figure 1 WORD LEVEL

| | Persuade Specialist | Inform Specialist | Persuade General/Lay | Inform General/Lay | Total |
|---|---|---|---|---|---|
| Total Words | 1263 | 1221 | 1210 | 1222 | 4916 |
| % Monosyl. | 59.9 | 57.90 | 53.14 | 56.14 | 56.77 |
| % Disyl. | 22.25 | 23.26 | 24.88 | 20.87 | 22.82 |
| % Polysyl. | 17.81 | 18.84 | 21.90 | 22.99 | 20.39 |
| Total Verbs | 111 | 93 | 94 | 101 | 399 |
| % To Be | 18.01 | 25.81 | 30.85 | 9.90 | 21.14 |
| % Active | 57.66 | 54.84 | 48.94 | 69.31 | 57.69 |
| % Passive | 24.32 | 19.35 | 23.40 | 20.79 | 21.97 |

This is a higher percentage of polysyllabism than found in some critical, theoretical works, e.g., E. D. Hirsch's Philosophy of Composition, Francis Christensen's Notes Toward a New Rhetoric, and Richard Lanham's Style: An Anti-Textbook. The fact that technical writing contains more syllabism than theoretical material in composition might be explained by a need in technical discourse for specialized words or "high density" words. However, this idea is undercut by the level of polysyllabic usage in the specialist categories. Rather than using more specialized, high density words writers used less (17.8 and 18.8 percent vs. 21.9 and 22.9) when addressing a specialist audience. In part this may be explained by the tendency of the authors of the samples we analyzed to dispense with pronoun usage and rely instead on noun repetition. This tendency is particularly strong in writing for a specialized audience, e.g., service or operational manuals for engineers. In addition we should consider the advantages to readability of repetition since it increases the cohesion of the whole discourse and, in particular, raises the reader's level of expectation and confirmation--both essentials to reading ease.

Academics in scientific disciplines disagree with technical writers and textbook maxims on the question of passive voice. Academics in engineering and physical and social sciences strongly believe in the necessity and appropriateness of the passive voice in their writing. Technical writing texts increasingly decry usage of the passive and English teachers have long urged students to write, where possible, in the active voice. Our sample suggests that across all modes and for both lay and specialized audiences industrial writing abjures passive voice except in fairly obvious places (where the active voice would have required awkward rewriting). Passive constructions appeared 22% of the time across all modes and audiences. Writers used the active voice between 49%-69% of the time. These figures support the advice of textbooks and English teachers to avoid the passive voice wherever possible. These writers did not use passive constructions 79% of the time. The use of "to be" forms as copula or state of being, of course, may often prove necessary. Students frequently confuse the passive with legitimate and requisite uses of "to be" and with use of first person--they often think that first person *per se* is active voice. This appears especially true when science or engineering majors attempt to re-learn the use of active voice. It may, therefore, prove especially valuable to teach students how to change passive forms to active forms (see for reference Richard Lanham's *Revising Prose* and *Revising Business Prose*, New York: Scribners, 1978, 1980 respectively).

## SENTENCE LEVEL

Technical writing textbooks urge writers to maintain a simple, clear style. In order to accomplish this many texts urge writers to use shorter sentences. Houp and Pearsall, who may be taken as typical, argue that readability of a text is enhanced when sentences are kept short. In part, they base this dictum on Rudolph Flesch's work which suggests that readability relates positively to sentence length. Since Flesch first proposed his scale of readability a number of researchers have tried to more accurately define syntactic maturity. Kellogg Hunt, for instance, argues that sentence length is a poor indication of syntactic maturity because it fails to take into account the immature writer's use of series of coordinate clauses linked by coordinate conjunctions (most frequently the conjunction *and*). Hunt, in his article "A Synopsis of Clause-to-Sentence Length Factors," advances the thesis that mean clause length and mean T-unit length are the best of all indices of "grade level" (a T-unit is defined as a main clause and any subordinate clauses attached to the main clause).[4] In the same article Hunt revised La Brant's index for assessing amount of subordination. Hunt's method gives a simple ratio of subordinate clauses to main clauses and provides a researcher with a clear sense of a writer's use of subordination. Figure 2, on the following page, gives the results of our analysis of industrial writing at the sentence level.

Figure 2 SENTENCE LEVEL

| | Persuade Specialist | Inform Specialist | Persuade General/ Lay | Inform General/ Lay | Total | Hunt's Superior Adult |
|---|---|---|---|---|---|---|
| Total Words | 2506 | 3704 | 3342 | 3142 | 12694 | |
| # of Sent. | 136 | 167 | 133 | 165 | 601 | |
| # of T-Units | 149 | 178 | 172 | 180 | 679 | |
| # of Clauses | 196 | 274 | 263 | 249 | 982 | |
| # of Main Cl. | 148 | 183 | 172 | 177 | 680 | |
| # of Sub. Cl. | 48 | 89 | 91 | 72 | 300 | |
| Avg. Word/ Sent. | 18.25 | 22.27 | 25.09 | 18.99 | 21.15 | 24.7 |
| Avg. Word/ T-Unit | 16.74 | 20.82 | 19.45 | 17.42 | 18.61 | 20.3 |
| Ratio T-Unit/ Sent. | 1.09 | 1.07 | 1.29 | 1.09 | 1.14 | 1.24 |
| Ratio Clauses/ Sent. | 1.31 | 1.54 | 1.53 | 1.38 | 1.44 | 1.74 |
| Avg. Word/ Clause | 12.78 | 13.52 | 12.71 | 12.62 | 12.91 | 11.5 |
| Sub. Clause Index | 1.32 | 1.49 | 1.53 | 1.41 | 1.44 | 1.78 |

The writing we examined fell above Flesch's limits for readability at the "standard difficulty" level: 17-21 words per sentence (our sample showed a mean sentence length of 21.15). At the same time, our sample produced results considerably lower in both mean sentence length and mean T-unit length than Hunt's figures for "superior adults." Using these indices alone we might mistakenly conclude that industrial writers are less "mature" than the writers Hunt studied. However, Hunt examined samples which do not represent writing in the world of work--they differ widely in audience, purpose, and discourse mode from the samples we analyzed. We would expect these differences to affect the syntactic and semantic choices an author makes as he writes. In addition, the writers of our sample produced a higher mean clause length than did Hunt's "superior adults." Hunt established mean clause length as a significant measure of syntactic maturity. How may we explain these apparently contradictory results?

There are two factors to be considered in understanding the differences between our figures and those Hunt obtained. One, studies by Crowhurst and Piche (1977) and Rosen (1969) offer some evidence to suggest that differences in the aims, audiences, and modes of discourses will affect their syntax.[5] Two, we may expect the industrial authors whose writing we examined to make syntactical choices based on readability (even if intuitively). Research in psycholinguistics suggests that coordinated structures are more easily processed than subordinated ones.[6] E. D. Hirsch cites a number of studies showing that the clause represents the primary unit of semantic determinacy.[7] Clarity at the main clause level, Hirsch claims, is primary to understanding because deeper embeddings of information (e.g., subordination) are more difficult for readers to process. Where clarity is a significant factor in a discourse we may expect, therefore, a decrease in subordination. Certainly clarity was a major factor in the writing we examined. And, as might have been expected, the writers whose work we analyzed used significantly less subordination across all modes than did the authors Hunt examined (.44 to .78 subordinate clauses per main clause). Hunt points out that T-units, clause length, and subordination are interrelated so that T-unit length increases with larger main clauses and greater subordination. In this case, T-unit length decreases because the drop in subordination is great enough to offset an increase in clause length. The writers of our sample appear to achieve clarity in part by limiting subordination; indeed, they demonstrate considerable skill in producing clarity through word and phrase repetition and through coordination. Such a practice is clearly supported by psycholinguistic findings regarding clauses and subordination. Our own research suggests that further comparative studies need to be carried out to determine the effects of audience and discourse modes on the syntactic forms found in mature writing which serves widely varied purposes. Such study would have special significance for teachers who must move among a variety of composition courses and might lend support to case study pedagogy in particular. As we moved from the word and sentence level to the paragraph level we saw the tendency for carefully controlled subordination reinforced through headings and by means of coordinated paragraph development.

## PARAGRAPH LEVEL

Here we asked five basic questions: How frequently were topic sentences used? Where in the paragraph were they located? How were the paragraphs organized? What methods of development were employed? What cohesion strategies were most prevalent?

At this level we quickly discovered that we were dealing with a much more complex and ambiguous unit of discourse. With the word and sentence levels we had been able to divide the scripts between us; after reading only one sample at the paragraph level, we realized we would both have to read each text, then compare/contrast our conclusions. If there was disagreement, we had to talk until we resolved the problem. Part of our difficulty was perceptual. One of us would see a topic sentence; the other wouldn't. One of us would see a set of hierarchical relationships among sentences; the other would perceive an alternate set. Another problem was the difficulty of content. Many of the samples contained highly technical language, and our attempts to analyze were often complicated by our attempts to understand. And of course because reading is an individual act and because readers bring different sets of personal experience and expectations to a text, each of us at times "interpreted" paragraphs differently. A third problem was created by our methodology. We had decided to select paragraphs from three locations in each text, these three passages amounting to about 1,000 words. We were not, therefore, reading the entire discourse, but rather excerpts from it. Thus we were reading paragraphs out of context of the whole discourse. Paragraphs operate within a rhetorical field, and our approach neglected this field. Consequently, the logic of a paragraph which a writer had established earlier in the discourse sometimes remained unclear.

Previous studies of the paragraph generally suffer from two deficiencies. First, they usually do not classify their samples by audience and discourse mode in order to see how these two main variables affect paragraphing. Second, they draw their samples either from student writing or from The New Yorker, Harper's, or The Atlantic Monthly, ignoring the fact that few of our students will be writing for such audiences and implying that the textual demands of these publications apply equally well to writing in the world of work. We designed our project to remove both of these deficiencies.

Our first concern was the frequency with which industrial writers used topic sentences. Since Alexander Bain in the late nineteenth century, traditional writing texts have advised students to begin each body paragraph with a controlling generalization. Little actual research confirmed this advice until the mid-1960's when Francis Christensen's analysis of a number of paragraphs written mainly by professional writers concluded that most paragraphs have topic sentences and these most frequently come first.[8] But in 1974 Richard Braddock found in his study of 889 paragraphs by professional writers in major popular magazines that "considerably fewer than half of all the paragraphs in the essays have even explicit topic sentences, to say nothing of simple topic sentences."[9] Given these contradictory findings, what are we to tell our students? Furthermore, since both studies rely on a type of discourse which our students will normally not be required to produce, are they of any relevance at all to teachers who must prepare students for more practical writing tasks? It was our conviction from the outset that if we must be prescriptive, we should be so on the basis of a relevant sample; that is, we should find out what paragraphing expectations students will have to fulfill when they write on the job.

Since we have looked at only 16 texts, any conclusions we draw must be tentative and suggestive at this point. The 16 scripts, covering our four categories and encompassing a fairly broad range of discourse types, yielded 180 paragraphs. Of these, 29 contained only one sentence. In looking at these paragraphs, we wanted to find out how many of them contained explicit or implied topic sentences and how many had no topic sentence. By "explicit" we mean a single sentence which clearly serves to unify the remaining sentences in the paragraph. We were very cautious about identifying implicit topic sentences because of the inherent subjectivity of such a process. Therefore, we granted the "implicit" status only when we could quickly agree on what the sentence would say had it been stated. Figure 3 shows the results of our analysis of topic sentence frequency.

Figure 3 TOPIC SENTENCE FREQUENCY: N = 151 PARAGRAPHS

| | Persuade Specialist | Inform Specialist | Persuade General/ Lay | Inform General/ Lay | Total | % |
|---|---|---|---|---|---|---|
| PARAG | 28 | 48 | 36 | 39 | 151 | - |
| EX TS | 16 | 26 | 21 | 20 | 83 | 55 |
| IMPL TS | 1 | 2 | 2 | 2 | 7 | 5 |
| NO TS | 11 | 20 | 13 | 17 | 61 | 40 |

Our results come closer to supporting Braddock's findings than those of Christensen. That is, topic sentences do not control paragraphs nearly as often as Christensen and textbooks would have us believe. We found explicit topic sentences only 55% of the time in paragraphs longer than one sentence. Forty percent of our sample had no topic sentence. If we add back the one-sentence paragraphs and tabulate percentages for all paragraphs, we find that 50% have some kind of controlling topic sentence (explicit or implied); only 46% have an explicit topic sentence, a figure which compares favorably to Braddock's 45% explicit for all paragraphs. Although we do not yet have adequate numbers for our individual audience and function categories, one interesting trend does appear. The informative function has a clear edge over the persuasive, 55% to 45%, in the use of explicit topic sentences. The two main audience categories divide the explicit topic sentences almost equally.

Our second concern was the location of topic sentences. Traditionally, textbooks and some readability studies have favored the first sentence of a paragraph as the best location for the topic sentence. Christensen agreed. Braddock, however, found otherwise, concluding that only 13% of the expository paragraphs in his sample opened with a topic sentence.[10]
Figure 4 shows the breakdown for the 83 paragraphs in our study which had explicit topic sentences:

Figure 4 TOPIC SENTENCE LOCATION:
N = 83 PARAGRAPHS WITH EXPLICIT TOPIC SENTENCE

| | Persuade Specialist | Inform Specialist | Persuade General/ Lay | Inform General/ Lay | Total | % |
|---|---|---|---|---|---|---|
| TS First | 13 | 24 | 18 | 19 | 74 | 89 |
| TS Mid | 1 | 1 | 1 | 1 | 4 | 5 |
| TS Last | 2 | 1 | 2 | 0 | 5 | 6 |

Our sample suggests that if writers used an explicit topic sentence, they put it in the initial position 89% of the time. For all paragraphs longer than one sentence, the figure drops to 49%. For all paragraphs in our sample, 41% of them open with a topic sentence. Again, function seemed to influence topic sentence location. The informative mode used the initial position 58% of the time; the persuasive mode, 42%. Audience seemed to play little role. Clearly, writing in industry depends more heavily on the topic sentence in the initial position than does writing intended for popular magazines. Yet such topic sentences play less of a role than textbooks generally suggest. Nevertheless, the advice remains sound, for we found that other strategies such as sub-headings and layout often contributed to the top down arrangement which the initial position topic sentence effects. These supplementary strategies relieved the opening sentences of paragraphs from some of the responsibility for the deductive pattern. Students must be able to handle this top down pattern, but they should be able to effect it through ways other than just initial topic sentences.

Our third concern was paragraph organization. Most texts describe such patterns as the "general-to-particular" and "particular-to-general," often with variations such as "general-particular-general." The general-to-particular pattern is the basic model offered to student writers. Christensen, in his work on paragraphs, speaks of pattern in terms of "direction of movement" or "levels of generality," and we found these concepts useful in attempting our own classification of paragraphs.[11] As we read each paragraph, we looked for the superordinate generalization, then tried to determine what hierarchical relationship the remaining sentences bore to it. We were interested in where the superordinate generalization came in the sequence; in other words, did the paragraph move away from or toward this key sentence? If the former, we used Christensen's term "cumulative"; if the latter, we called it "periodic." Those were our only two classes at the outset, but it did not take long for us to discover a third type, what we came to call the "coordinate sequence." We were aware of Christensen's use of that label to describe one of the most basic paragraph types--a topic sentence followed by a series of subordinate sentences which were coordinate to each other. We use the term to describe a paragraph which has no single superordinate sentence. A paragraph, to earn this label, had to have two or more top-level sentences <u>of equal rank</u>. Each of those top-level sentences might have sentences subordinate to it, but there had to be at least two of these top-level sentences parallel to one another. Figure 5 summarizes our findings.

Figure 5 PARAGRAPH ORGANIZATION: N = 180 PARAGRAPHS

| | Persuade Specialist | Inform Specialist | Persuade General/ Lay | Inform General/ Lay | Total | % |
|---|---|---|---|---|---|---|
| Cumulative | 15 | 25 | 21 | 21 | 82 | 46 |
| Periodic | 2 | 3 | 2 | 0 | 7 | 4 |
| Coordinate | 3 | 18 | 8 | 9 | 38 | 21 |
| One-Sen. Parag. | 10 | 5 | 6 | 8 | 29 | 16 |
| Others | -- | -- | -- | -- | 24 | 13 |

Our study suggests that the general-to-particular pattern is far less dominant than texts and teachers lead students to believe. Only 46% of our paragraphs were organized this way. The periodic paragraph appears to be of minimal value to writers in industry, only 4% reflecting this pattern. Most interesting, we feel, is the fact that 50% of our paragraphs were what we called "atypical." The coordinate sequence appeared most frequently in this atypical category, showing up 21% of the time. One-sentence paragraphs (16%) occurred consistently in our sample. The "Others" category (13%) consisted of transitional paragraphs and several other fairly rare patterns which did not fit the three primary groups. All of these figures clearly undercut traditional dictums about paragraph pattern.

Our fourth concern, paragraph development, was informed by this question: Does instruction in the traditional methods of paragraph development have any value? Most of the traditional methods derive from the rhetorical modes--description, narration, classification/division, comparison/contrast, cause-effect, and so on. Other methods which texts frequently cite are reasons, examples, enumeration, and question-answer. We wanted to know how much good writing in industry relied on these traditional methods of development. In 1970 Richard Meade and Geiger Ellis reported the results of their research on paragraph development in three sources: The Saturday Review, English Journal, and a morning daily newspaper, the Richmond Times-Dispatch.[12] They found that traditional textbook methods were used less than half the time in the 300 paragraphs they studied. In 56% of the paragraphs no textbook method was employed.

The Meade-Ellis study is interesting, but how relevant is it to writing in industry? Looking for an answer to this question, we studied the 180 paragraphs in our sample to see if any particular methods of development dominated. Rather quickly we dropped the idea of finding one central method in each paragraph, for it was clear that many of the paragraphs in our sample relied on a combination of methods, traditional and atypical. (Meade and Ellis found this combination tactic in nearly 21% of their sample. So we altered our approach, deciding to count each occurrence of a method. Figure 6 contains the results.

Figure 6 PARAGRAPH DEVELOPMENT (201 Occurrences)

| Method | Persuade Specialist | Inform Specialist | Persuade General/ Lay | Inform General/ Lay | Total | % |
|---|---|---|---|---|---|---|
| Traditional: | | | | | | |
| Reasons | 4 | 2 | 7 | 4 | 17 | 9 |
| Example | 0 | 6 | 2 | 2 | 10 | 5 |
| Analogy | 0 | 0 | 0 | 0 | 0 | 0 |
| Contrast | 1 | 9 | 5 | 3 | 18 | 9 |
| Cause-Effect | 2 | 9 | 4 | 6 | 21 | 11 |
| Classif. | 2 | 1 | 0 | 1 | 4 | 2 |
| Chron. | 1 | 0 | 6 | 11 | 18 | 9 |
| Enumer. | 6 | 2 | 9 | 6 | 23 | 11 |
| Descrip. | 4 | 0 | 0 | 1 | 5 | 2 |
| Ques.-Answ. | 0 | 0 | 0 | 0 | 0 | 0 |
| Atypical: | | | | | | |
| Elabora. | 8 | 14 | 17 | 11 | 50 | 25 |
| Logical Chain | 1 | 2 | 3 | 1 | 7 | 3 |
| Process | 1 | 9 | 0 | 9 | 19 | 10 |
| Analysis | 1 | 2 | 0 | 0 | 3 | 1 |
| Definition | 0 | 1 | 1 | 0 | 2 | 1 |
| Tech. Desc. | 0 | 2 | 0 | 0 | 2 | 1 |
| Prob/Solut. | 2 | 0 | 0 | 0 | 2 | 1 |

Most interesting is the finding that roughly 58% of the identified methods of development fell into the traditional category, reasons, contrast, cause-effect, chronology, and enumeration being the most frequently employed. Nearly as interesting was the emergence of a method which did not match up adequately with textbook descriptions, a method which cut across function and audience categories and which we labelled "elaborative." Paragraphs employing this method begin with a superordinate generalization, then the remainder of the paragraph fleshes out this generalization at lower levels of abstraction. The subordinate sentences do not constitute examples; they provide texture for the initial abstraction. Once we saw this method and labelled it, we began to see it often. How much this was a matter of making paragraphs fit our newly created expectation is difficult to say. Nevertheless, we found this method occurring 25% of the time, and our results parallel to some extent those of Meade and Ellis, who identified a non-traditional method which they called "additional comment" and which showed up in 19% of their paragraphs.

These findings, when added to those pertaining to paragraph organization, suggest that traditional methods of development should be taught, that writers in industry use the methods and the thinking implicit in them frequently. However, greater attention in our classes should be paid to the combining of methods within paragraphs and to thinking and writing strategies which encourage students to manipulate levels of abstracting and hierarchical relationships. So dominant was the presence of this skill at the paragraph and discourse levels that we believe it should be a central objective of all expository writing courses.

At this stage we can offer only impressions regarding our final paragraph concern, cohesion. We are still working on our methodology, which has been influenced by Halliday and Hasan's Cohesion in English. Basically, we examined each paragraph for those primary lexical and grammatical features which bound the sentences together into a coherent unit. Our checklist contained the following techniques, most of which are found in textbook discussions of coherence: pattern, sentence pattern repetition, consistent person and subject, pronoun reference, word and phrase repetition, and transitional words and phrases. Rather than attempting to qualify each of these, we elected to estimate the degree to which each of these functioned in the paragraphs.

We can offer these tentative conclusions about our sample: 1) Pronoun reference played less of a role than we had expected. Writers in industry appear to prefer repeating a key word rather than substituting a pronoun for it, choosing to risk monotony over ambiguity; 2) Repetition--of sentence patterns as well as words and phrases--proved to be a very strong device for achieving coherence; 3) Transitional words and phrases proved to be less prevalent than we had expected, playing a negligible role in at least 25% of our paragraphs; 4) Writers generally failed to keep a grammatical subject consistent throughout a paragraph. They kept the general topic consistent, but opted for "grammatical chaining" i.e., converting a grammatical element from the preceding sentence into the subject of the succeeding sentence so that a chaining effect occurs throughout the paragraph; 5) Graphic and typographic features of a text play an important role in coherence at both the discourse and paragraph levels. These visual components of texts should, therefore, be explored more fully in writing classes.

## NOTES

[1]For background on the concept of writing-across-the-curriculum see James Britton, The Development of Writing Abilities (11-18), London: Macmillan Education Press, 1975; Randall R. Freisinger, "Cross-Disciplinary Writing Workshops: Theory and Practice," College English, 42 (October, 1980), 154-166; Randall Freisinger and Bruce Petersen, "Writing Across the Curriculum: A Theoretical Background," Fforum, II (Winter, 1981), 65-67, 92; Toby Fulwiler, "Showing, Not Telling, at a Faculty Workshop," College English, 43 (January, 1981), 55-63.

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# RESEARCH IN THE COMPREHENSION OF ENGINEERING LECTURES BY NON-NATIVE SPEAKERS

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## PROBLEM

Lectures are a critical mode of instruction in American universities, yet many non-native speakers of English (foreign students) have severe problems understanding even well-structured and well-presented lectures. In many science and engineering courses where the lectures often do not repeat the text, non-native speakers having trouble with lectures simply miss important course material; there is no text which extra effort will master, a fact too frequently noted by professors and documented by Holes, Morrison, James, and Wijasuriya. This problem affects us as technical writing teachers since many of us are faced with non-native speakers in our courses or are called in by technical departments to help train the non-native student to be more effective.

The number of times this occurs will vary, but we might note that foreign student enrollments in the United States as reported by The Institute of International Education have risen from 203,070 in 1976-77 to 286,340 in 1979-80, and this rise is expected to continue. Further, we should note that approximately 70% of all foreign students are studying science and technology, and that in some fields their concentration is remarkable. For instance, foreign students account for over 50% of the graduate enrollment in some departments at the University of Michigan College of Engineering.

What can we do to help reduce the lecture comprehension problems encountered by numbers of our foreign students, especially incoming students? To answer this question, a study was commissioned by the University of Michigan Graduate School to determine the cause(s) of problems in lecture comprehension especially amoung science and engineering students. This paper presents the results of that study.

## BACKGROUND

The hypothesis traditionally offered for foreign students is that such problems with lecture comprehension derive solely or principally from linguistic shortcomings, that is, from difficulties with pronunciation, vocabulary, and accents compounded by fast speech phenomena. On the surface there seems to be some merit in such a hypothesis. However, our research and that by several British applied linguists suggests that while linguistic shortcomings may contribute to incomprehension, they are certainly not the only impediments or even perhaps the most serious ones. Holes attributes much of the problem to the students' lack of culture-bound knowledge and their inability to interpret speaker's intentions; Wijasuriya and Morrison stress the students' inability to perceive discourse markers and logical relationships and connectives; and in addition to stressing these points, Candlin and Murphy also stress problems in speech perception and problems in identifying the role of cohesion, coherence, intonation, and movement (or kinesics).

## SUMMARY

All of the problems listed above surely contribute to incomprehension, especially for students with quite low-level skills in English. However, after some weeks of accommodating to varying speaking styles, slightly more advanced students can often handle pronunciation, vocabulary, accents, local discourse markers, and connectives even though they still can't comprehend lectures.

Our research suggests that one main problem for such students is that they fail to perceive the rhetorical structure or overall organization of a lecture and are thus unable to integrate the individual bits of information they do hear into any meaningful context. (This result is quite consistent with the research literature in psychologistics and cognitive psychology.) Equally seriously, students often fail to perceive the organizing role of theory in structuring activities in their field. In particular, engineering students failed to identify the role of theory in the problem-solving process that underlies engineering itself; they frequently did not see engineering as a series of on-going problems where each stage of solution exposed new problems to be solved.

These results have significant implications for course planners and material designers; instruction on lecture comprehension for non-native speakers (and interestingly enough for some native speakers) might focus significantly on discourse-level structures and the cues native speakers use to expose those structures. These cues have been described by Candlin and Murphy in some detail.

## METHODOLOGY

Our methodology involved selecting stimulus materials, exposing both native and non-native subjects to these materials, and then analyzing protocols the subjects provided for completeness and accuracy of comprehension. The materials, subjects and procedure are described in more detail below.

Materials: To provide a sample lecture for our subjects, we choose a 16-minute videotaped lecture segment on fracture mechanics from a first year graduate course in Mechanical Engineering. It met the criteria we had established for such a sample lecture: it was authentic (was a real class lecture), had a level of subject matter understandable to non-majors in its field, was comprehensible as an isolated segment independent of context, and was well-organized, clear, and coherent in itself.

As the appended material illustrates, the lecture segment describes how a crack moves through a substance and how such crack movement (or crack propagation) can be stopped. The content of the lecture has been clearly understood by freshmen and non-engineers in a variety of fields such as political science and banking, linguistics and education. A transcript of the first ten minutes of the segment appears in Appendix A; a tree-diagram of the entire lecture appears in Appendix B.

Subjects: The subjects for this study were fourteen non-native speakers of English and six native speakers. The non-native speakers included ten graduate students and four undergraduates from nine different countries and eight different fields of engineering, plus physics. The native speakers (all Americans) included three undergraduates in engineering and three post-graduates without engineering backgrounds.

Procedure: All subjects were instructed to listen or watch for "main ideas" and to take notes as they would in a regular lecture situation. They were then asked to explain what the lecturer had said as if they were telling a friend who had missed the lecture but who needed the lecture material to prepare for a test. In this task, they were allowed to use their notes and to take as much time as they needed. Thus, all of the subjects produced immediate-recall protocols from notes, and several subjects also participated in follow-up interviews. The protocols were tape-recorded, transcribed, and analyzed for completeness and accuracy. A "successful" protocol was defined as one which identified the problem-solution structure of the lecture, which identified the relation of theory to tests of theory, and which captured the mechanisms and data points presented in the lecture.

## RESULTS

The results of this study were somewhat surprising. Among the non-native speakers, three failed probably due to inadequate English (they produced protocols averaging only 82 words long). Six failed despite adequate English; they produced relatively coherent protocols averaging 349 words long, and they felt that they had understood the lecture segment. Four probably succeeded, and one definitely succeeded as illustrated in the protocol in Appendix C. Among the native speakers, three failed (including two engineering undergraduates) and three succeeded (including two non-engineers).

## INTERPRETATION OF RESULTS

The traditional hypothesis attributes failure to linguistic shortcomings in pronunciation, vocabulary, and accents. However, this hypothesis does not account for our results. Six non-native speakers failed despite adequate English and their sense that they understood, but more confusingly, three native speakers failed whose English was perfectly adequate to the task. All of these subjects understood most of the details of the lecture; they had copious notes and produced long protocols. However, they didn't see how things fit together.

Thus, other factors than pronunciation and accent seem to be at work here. All of the failures missed the overall rhetorical structure of problem-solution and the organizing role of theory in the particular problem-solving process illustrated. Both the structure and role of theory are prominently cued, as indicated by the transcript in Appendix A, and both were stressed by gesture and intonation in the videotaped version of the lecture. In spite of the problem-solution cues, seven of the nine who failed were seemingly misled by narrative or chronological cues in the lecture: "Now, in the ... early 1960's ... then ... then ... " The remaining two failures focussed heavily on practical application, not on theory, even though much of the lecture dealt overtly with theory.

Why should these types of failure occur? Typically, science and engineering students take notes by copying what is written on the blackboard; they often minimize the role of introductory remarks, audio-visual materials, etc. Unfortunately, these minimized sections are exactly the parts of the lecture in which structure is outlined and main points emphasized. The student who merely copies off the board catches some individual points but often does not see how they fit together. To further complicate this issue, many non-native speakers are used to having professors in their home countries write the main points and the rhetorical structure in one corner of the board, each new point being added as it appears in the lecture. This is the equivalent of hearing "Now here comes the next main section of this lecture and it explains why the Cook-Gordon mechanism provided one type of solution to our problem of catastrophic crack propagation." Unfortunately for the non-native speakers, few American professors have such obvious signposts for their lectures, even though the lectures may be well organized and carefully delivered.

Our contention that missing the rhetorical structure of the discourse should create comprehension problems is quite consistent with the research findings in cognitive psychology and psycholinguistics. For instance, Meyer has argued from experimental results that items are better remembered and more easily processed if they are attached to an idea high in the organizational hierarchy of a text. Cirilo and Foss, Tenenbaum, Kieras, and Huckin have made similar arguments, Kieras and Huckin in particular for the function of topic sentences in technical texts. Kieras's arguments are based on experimental research and Huckin's on a wide survey of the research literature in cognitive psychology and psycholinguistics. Such insights have been incorporated into a seminal model of text comprehension and production by Kintsch and van Dijk.

One final point should be noted about this particular lecture type. Science and engineering are problem-solving professions, and science and engineering lectures often reflect this orientation. However, science and engineering students frequently do not see their fields as a series of on-going and inter-related problems to be solved, since much of their course material consists of isolated, pre-formed, and pre-digested "problems." The student has only to figure out which formula should be used to process the data given in the problem. He or she rarely has to eliminate irrelevant data, find missing data, or reformulate a poorly formed or misleading problem statement. Although these are important skills in the field, they are not skills demanded often enough of students and students often fail to have or perceive them. Thus, a kind of cultural conditioning tied to methods of science and engineering instruction seems to be largely responsible for the failure of our engineering subjects to "understand" this engineering lecture. If we are to teach students to understand and communicate more effectively, we may need to point out the organization of their fields as well as the organization of their discourse.

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## Appendix A

## Prof. Caddell on Fracture Mechanics

I indicated, I think, in early comments I made about Chapter 9, that probably the biggest single failure in the early days of composite work was the fact that if a crack started propagating it generally went catastrophically. For two reasons, really: One, although it's fundamental can be overcome, and that is that many of the matrix-fiber combinations were made of materials themselves that were fairly brittle--their strain-to-fracture, regardless of whether they were fiber or matrix, was low. But that has been overcome, and we'll talk about it in a qualitative way in just a second. The real problem is that there was no way to stop the crack from propagating because the fracture toughness of the material--that composite itself--was just too low. Now, in Figure 9-10, this is meant to illustrate--we used to run a little experiment in one of our courses where we took a single fiber of boron in an epoxy matrix and tried to get as good a bond along this interface as we possible could, hopefully making that as strong as possible. And inevitably, when those composites were loaded and they broke, usually the fiber cracked first--because its strain-to-fracture was smaller--That immediately tended to reduce, to some extent, the load carrying capacity (because now you've lost some of the stronger material as far as your cross-sectional area goes) and the crack would just catastrophically propagate: we couldn't stop it at all. That's all I'm implying here, that although in general--because of its larger sizes--I don't mean that the crack here has come about due to loading. If it were just pure loading, very often the first thing the crack is going to be a fiber because its fracture strain is lower than a matrix. But if a crack exists in a composite, it's more likely, on the average, to exist in the matrix because it's got a much greater area in which initial cracks could exist. So I'm just indicating here, suppose we did have a crack here, if this is a material of very low fracture toughness, the crack starts to propagate, we're almost getting back, you might say, to a Griffith-type situation, where the stress is maintained, as the crack length increases the stress required to cause continuing propagation really decreases, if you don't start dropping the loads off it's going to go catastrophically. And that is what happened with many many composites where the major factor was to try to make them as strong as they possible could, and people began to realize, well, we've got to do something to improve the fracture toughness.

Now, in the--I think it was the early 1960's, these two men named Cook and Gordon--uh, this book by Gordon, by the way, if you ever want to read a technical book that almost reads like a novel, I would highly recommend it, it's, uh--I always hate to push stuff like this, because you might think I have an interest in this book company, but it's a British company, it's called The New Science of Strong Materials, or Why You Don't Fall Through the Floor. So I think you can even tell from the title, it's kind of--it's a terrific book, really, I think you'd very much enjoy reading it. Paperback. But in this, uh, he talks about the use of different type materials, and one chapter on composites he goes into this discussion--

which I better draw a sketch here, because it really isn't completely shown in figure 9.11--is what I'm gonna refer to.

But suppose we had a crack in part, and over here we have a fiber. And we're loading it on this end. Now it turns out--and I can't prove this to you in two minutes here, you'd almost have to read the original paper--but making a stress analysis, Cook, I believe, probably did the analysis, found that ahead of this crack and at right angles to the applied load there actually is a tensile stress that's set up at this interface. In other words, even though the tensile effect is this way, there is a tensile result that occurs at right angles to the applied load.

Now you'd almost have to read the original paper to see why. The whole idea here when they theorize this, and uh on the basis of analysis at least, said that well you know if this crack starts to propagate in this manner, as it gets closer and closer to this fiber, if this--the tensile stress that's set up in this direction under this applied loading--if it exceeds what they refer to as the adhesive strength, that is, the strength normal to the fiber at this interface, if this stress gets large enough it may start to open up a crack along the fiber, uh, it will debond, in other words. Then, as this advancing crack comes into this region, finally--and I'm gonna highly exaggerate this--this type of argument indicated that two things could happen. One is that the debonding along here would open up new crack surface area; that requires energy (the energy that's stored in the body), so if you're gonna, if you can use some of this excess strain energy to cause debonding along the interface--where this crack is parallel to the applied load and that's not gonna be as dangerous to us as if it was at right angles to the load--that it is conceivable that all the excess strain energy could be used up to do this instead of having the crack continue across the section. Secondly, when the advancing crack runs into this region it sort of blunts it: it causes the entire crack shape to change, and a crack with that kind of configuration would be far less serious in general than one with a very sharp notch.

Now this was a theory that was proposed, and it turned out that experiments did tend to support it (and I'll indicate one in just a minute). But the key thing , in this Cook and Gordon theory, it says that the debonding between the matrix and the fiber occurs before the crack reaches the fiber. So keep that in mind.

That was the proposed mechanism. It turns out it does not work for every combination of fiber-matrix materials. It's not a universal--Uh, the tensile stresses conceivably occur. But even under tensile stresses here, depending upon...

APPENDIX B

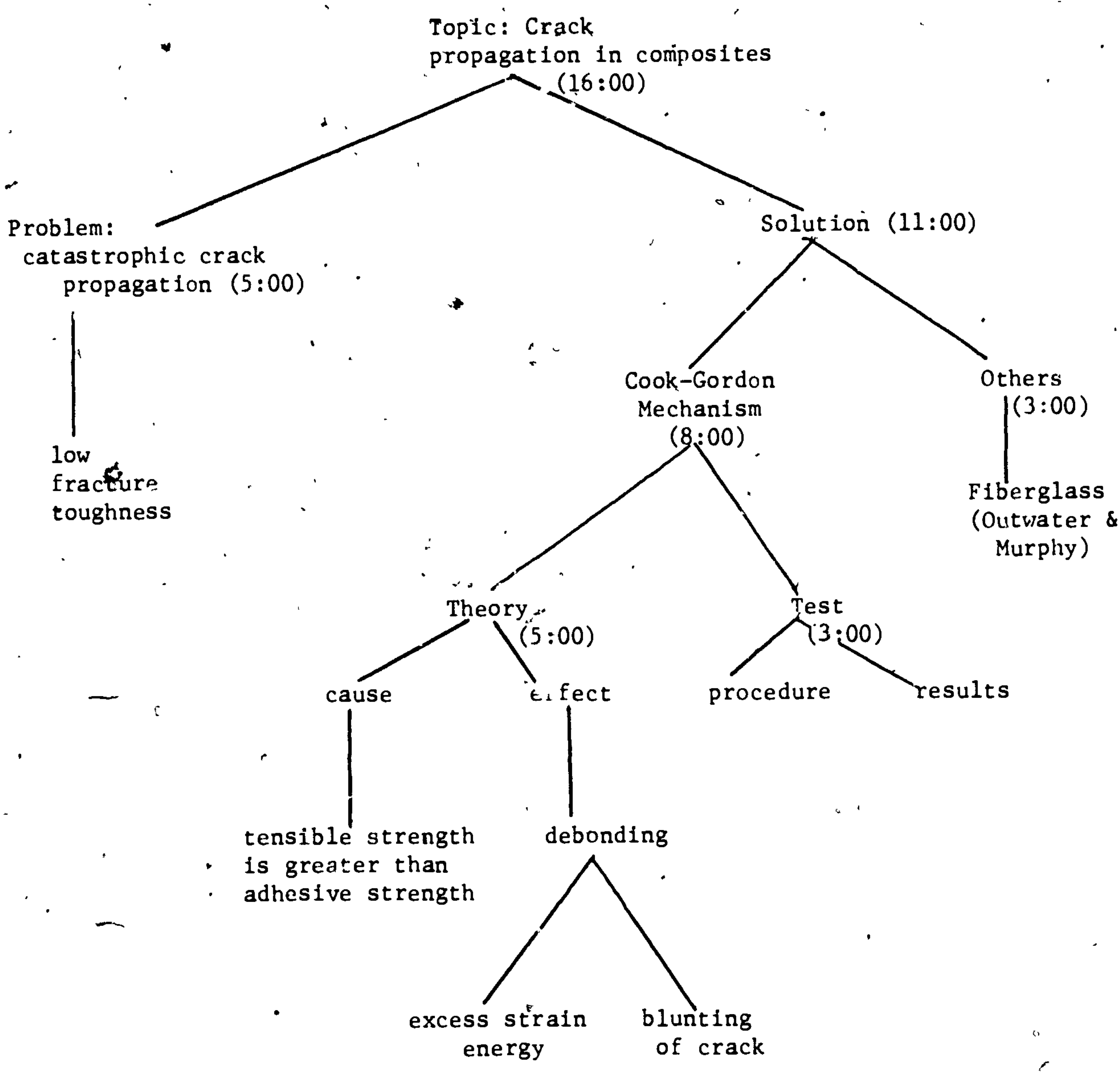


Figure 1. Overall structure of Caddell lecture, with time breakdown

# Appendix C

Example of successful comprehension, from 21-year old Chinese student (H.K.) in Computer Engineering, who studied English for 14 years in his home country but has been in the U.S. only three months:

This naturally is about mechanical engineering and the major emphasis is on cracking in fracture and and ah...for a composite material which is made of matrix and fiber cracking always occur and cracking occurs it will propagate along the... sorry, I mean propagate perpendicular to the matrix and fiber. This crackeling crackeling occurs and the strength and strength of the fiber-matrix decrease and also the fracture of toughness decrease. Crackeling is propagating along-- sorry, I mean cracking is propagated perpendicular to the mat-- of matrix and fracture matrix and fiber.

I -- the technical book called The New Science of Material ehm, it can be -- theory is being present. Consider, consider fiber, consider...material composite of fiber-matrix and - part of this mater tensile stress increases and cracking occurs perpendicular to the direction of app--...no... When strength of fiber increases, debonding is occurred along-- -perpendicular to the fiber and strain energy is increased in other areas of the material; therefore, the crack, the crack is not propagated in a perp-- in strictly perpendicular direction, we have to note. In fact, there is some ... occurs in the crackin process. Some cracking occurs along the direction of the ... while some of them occur perpendicular to the direction of note. Before the crack, before the cracks reach the fibers, bonding between fiber and matrix occur in the direction perpendicular which is in the direction parallel to the direction of note. When cracking occur there is a trade-off between strength and toughness: as strength is increased, toughness is decreased and vice versa. This process is called "Cook-Gordon mechanism" and it increased at least and this mechanism at least doubles the toughness of the composite materials. But the combination is so complex that there is no-- so that there is no single theory or equation that enable us to calculate, to calculate the cracking of the composite material. Sometimes there is no debonding and sometimes...it doesn't and sometimes it does occur. When there is no debonding, the crack propagate directly perpendi...through the fibers and the fibers is not affected. There are so many variables in this kind of problem such as debonding and ... strengthen. To this day there is no single equation or theory that enables, that enables us to ... all possible situation eh that's all.

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15 Supplementary Notes

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16 Abstract

The 32nd annual meeting of the Conference on College Composition and Communication had 20 sessions with over 75 papers relating to various aspects of technical communication. The rhetoric and ethics of technical communication, recent developments in technical communication, pedagogical techniques, empirical research, courses and curricula, and business writing are the important subject areas represented.

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ABSTRACT

The 42 papers in this volume discuss a variety of technical writing topics. The following are some of these topics: (1) industry's views on new directions in technical communication, and the technical writing skills that industry needs; (2) an interdisciplinary approach to teaching technical report writing in the community college; (3) designing minors in technical communication for technical students; (4) the composing processes in technical communication; (5) ethos in technical discourse; (6) applying selected rhetorical strategies to teaching professional and technical writing; (7) what beginning teachers should know about teaching business and technical writing; (8) using sentence combining in technical writing classes; (9) perspectives on audience awareness in technical communication; (10) using analogies within prewriting activities; (11) practical applications of technical writing; (12) trends in liability affecting technical writings; and (13) attitudes toward English teachers who "moonlight" as writing consultants. (RL)

*NASA Conference Publication 2203*
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# Technical Communication

## *Perspectives for the Eighties*

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## PREFACE

This Conference Publication contains the proceedings of the technical communication sessions at the 32nd annual meeting of the Conference on College Composition and Communication held in Dallas, Texas, March 26-28, 1981. The Program Chair for the annual meeting was James L. Hill, and we are indebted to him and to all the others who arranged the conference program.

As this proceedings suggests, [illegible]echnical communication has become an important subfield within 4Cs and is becoming an intrinsic part of many undergraduate curricula. Technical communication as a separate discipline, however, is relatively new. For that reason, we think it important to p[illegible]pare a proceedings that can make current research available as quickly as possible.

In order to [illegible] this proceedings useful, authors of papers were asked to revise and dev[illegible]e papers they actually gave. In addition, session chairs, associate [illegible], respondents, and recorders were encouraged to write papers or prepare [illegible]ent statements, even if their remarks had been impromptu or they had made no substantive statements at the sessions themselves. In several instances, new material has been prepared for this proceedings. Thus, in some ways, this proceedings is more comprehensive than the sessions actually were. Unfortunately not all papers are included, as several authors wished to revise them more extensively than time permitted. With over 75 papers, however, this proceedings represents about 80 percent of those that were presented at the conference. The papers are published camera-ready as submitted by the authors.

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Compilers

CONTENTS



*Pages 1 to 316 are published under separate cover.

PANEL B-10. TEACHING GRAPHICS IN TECHNICAL COMMUNICATION: A PRIMER FOR BEGINNING TEACHERS



PANEL B-14. EXPANDING THE ROLE OF TECHNICAL WRITING IN THE 1980s



PANEL B-20. WRITING PROGRAMS: CONNECTIONS BETWEEN THE COLLEGIATE AND BUSINESS WORLDS



PANEL C-15. TEACHING TECHNICAL WRITING TO MINORITY STUDENTS: PERSPECTIVES FOR THE 1980s

PANEL D-20. RESEARCH IN BUSINESS AND TECHNICAL WRITING: THREE EMPIRICAL STUDIES



Part 2

PANEL E-9. NEW DIRECTIONS IN TECHNICAL COMMUNICATION: THE VIEW FROM INDUSTRY



PANEL E-16. DESIGNING TECHNICAL WRITING PROGRAMS AT TWO-YEAR AND FOUR-YEAR COLLEGES

## PANEL F-9. THE COMPOSING PROCESS IN TECHNICAL COMMUNICATION



## PANEL F-10. ETHOS IN TECHNICAL DISCOURSE: THEORY AND PRACTICE



## PANEL F-14. NEW RHETORIC AND TECHNICAL WRITING

PANEL I-15. PRACTICAL APPLICATIONS OF TECHNICAL WRITING



11

Panel E-9

New Directions in Technical Communication:

The View from Industry

## AN INDUSTRY PANEL AT AN ACADEMIC CONFERENCE: WHY?

## NEW DIRECTIONS IN TECHNICAL COMMUNICATION: THE VIEW FROM INDUSTRY

### PANEL INTRODUCTION

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Like most of you, I teach what the universities call "technical writing". Some years ago, when I first attended the local chapter of The Society for Technical Communication (STC), several of the long-time technical writers welcomed me by telling me that I didn't know anything about technical writing and that whatever I was teaching wasn't it.

At that time, I had been teaching the course, at two different universities, for several years and had received enough positive feedback from students and colleagues to know I was doing something right. And yet, I also knew something was wrong; I knew I didn't know enough about what I was doing--but surely I knew something. In response to my new STC acquaintances, I began a low-key campaign to convince them that report writing (for that's what the "technical writing" course really is) fell within the purview of "technical writing". On the other hand, they held that technical manual production was what "technical writing" really meant, and they set about to convince me of that.

That was many years ago. In the intervening years, as a university instructor and seminar leader and as a consultant to business and industry, I have met and talked with a great many more technical writers and engineering writers who produce manuals, engineers who write manuals and reports, scientists who publish papers, businessmen who rely on reports and proposals, editors who fulfill a variety of functions, and others. What I have discovered is that indeed at that first meeting I was right, that report writing is part of technical writing. But, I have also discovered that those technical writers were also right, that I knew very little about technical writing, about what it means in business and industry, about what industry needs from those of us in the classrooms.

This session is, I believe, rather unusual in that it brings technical communication practitioners from industry to an essentially academic conference. The reason for the session derives directly from that earlier conflict I found myself in: from one perspective, regarded by many as an expert in technical writing; from another, regarded by equally as many as an absolute novice. The goal of today's panel is to make it possible for those of us in university- and seminar classrooms to partake of industry observations on what is needed from technical writing courses and technical communication programs.

We have tried to present a panel whose training, experience, and current responsibilities reflect the continuum of meanings that "technical communication" has in industry. R. K. Ransone, an aerospace engineer turned proposal specialist, considers some reasons he believes engineering students turn-off to communication studies. Frank Smith, a PhD in English who is manager of technical information of an aerospace corporation, discusses some writing concepts he wishes we had taught the people he works with. J. W. Dillingham, a publications management consultant, defines some of the distinctions in job categories and responsibilities. John Lane, a chemical engineer, tells us about some of the reasons for the in-house writing training program he runs.

I would particularly like to thank these representatives from industry who are and/or work with technologists for venturing out of their world into the world of English teachers who, as we all know, are seen as wearing ministerial collars and correcting split infinitives. Gentlemen, thank you for caring enough about your field--and ours--to take that risk.

# TECHNICAL WRITING AND COLLEGE COMPOSITION

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The papers delivered at the two joint seminars, "New Directions in Technical Writing: The Educators' View" and "New Directions in Technical Writing: The View from Industry," need no further summary. However, as co-chair of the second session, I want to comment briefly on the implications of both meetings.

The pairing of academic and industrial representatives promised a confrontation; there was none. Instead, the papers were striking in their unanimity. In the morning session, the professors documented the growing demand for technical writers, the usefulness of this training as reported by graduates of technical writing programs, and proven methodologies for establishing such programs. In the afternoon, the speakers from industry fully supported the professors' propositions. Yet, even in the context of nearly total agreement, all of the papers had the air of special pleading. Since the traditionally perceived gap between academia, on the one hand, and business and industry, on the other, clearly did not exist, to whom were these pleas addressed?

It seems obvious enough that the unacknowledged adversary, the common opponent in need of convincing, is the university faculty at large who participate in a curriculum which fails to produce in a significant number of its graduates that fundamental level of literacy which is necessary to earning a living, thus making the training acquired in the university productive and useful to society. That English departments were not singled out as villains was perhaps an exercise in superior tact, given the context of the meetings, but it is significant that R. K. Ransone, from Vought Corporation, took pains to point out that technical and scientific faculty are also guilty of perpetuating an academically foggy pseudo-jargon. The unspoken charge was indeed a broadside: what is going on in our universities that produces graduates who cannot write and who therefore require their employers to undertake the teaching of basic writing skills, teaching the universities should have done in the first place?

It is strange that such a question has to be asked at a time when the academic community is giving more attention to the written language than ever before. An increasing number of faculty, for example, conduct research in pedagogical theory. Their concerns are at once diverse and minutely particularized and center at the moment on error identification within a conceptual emphasis on writing as process rather than as product. How does one define error within an ongoing process? At what point in the writing process do identifiable errors occur? What cognitive procedures generate errors? If both students and teachers can be made to understand the relation between cognition and error, can they not both make corrections with far greater understanding than if they simply follow "rules"? Another group of theorists focuses on the written text as mediating message between encoder and decoder; in this view, the language in the text becomes a series of signs to which meaning may be arbitrarily assigned and for which no meaning is innate. The meanings so assigned by encoder and decoder are of necessity not identical, since meaning is a result of not only conscious intent but also unconscious response. The idea of the text as concrete product is therefore illusory, and the emphasis is once again on process. In both groups of theorists, the debate is heated and intense.

When the smoke clears, a good deal that is useful will no doubt appear--but in the interim, our students still can't write. What is going on evidently has not addressed the deficiencies in writing skills perceived by those outside academia. I suggest that at least part of the problem lies not in these valid subjects of theoretical inquiry but in the context in which they take place. The academic community traditionally rewards the new idea, as indeed it should, but since the rewards are few and the competitors many, the impulse is often toward exclusivity rather than communication, creating a covert motivation running directly counter to the explicit purposes of research. Such exclusion, especially in those disciplines seeking to establish themselves as distinct areas of inquiry, is most readily accomplished by the invention of a specialized vocabulary which identifies the intellectual content of the discipline as something new and apart from generally shared knowledge and language, something in which only the initiated can participate.

But the danger of new vocabularies is that they can descend to jargon; old ideas can be disguised as new ones, clothed in a bristling terminology which makes the commonplace seem esoteric. The pedagogical theorists are prone to borrow liberally from the psychologists and to fish in the even murkier waters of the educationists; the threatening connotation of the term deconstruction speaks for itself. The plain fact is that it is relatively easy, for any English professor who manages to find some spare time, to pick up the lingo and sound like an expert. When judgments about rewards such as tenure and promotion are made quantitatively on the number of publications, the results are predictable: a proliferation of journals and the publication of material which only obscures the issues. Who can tell the expert from the mimic, since in both cases the language serves to disguise the message? Yet the faculty who play the publication game are not entirely to blame; they inhabit that practical world of underpaid reality in which promotion and tenure are essential not merely to pay the rent but simply to hang on to their jobs. They are caught in a system which guarantees its own failure.

The damage to valid and necessary inquiry is immense, but the negative effects in the classroom are even greater. The majority of college composition classes are taught not by the publishing academics but by the lowerechelon faculty--the graduate assistants, the part-time, the non-tenure-track--who are powerless to change policy. Their jobs depend on their doing what they are told to do, or often on doing something without being told anything, and on maintaining enrollment figures by not failing too many students. They receive little if any support from faculty in other departments who feel, with some justification, that assuming more than minimal responsibility for writing adequacy is an unfair burden. In addition, as pawns of an unsympathetic administration, which has pressing and very real financial worries, composition faculty are routinely overloaded so that both effective teaching and current research become impossible. The very faculty who are most in need of clear statements of theoretical positions are those who have no time to sift through the mass of printed jargon, to break the false barriers erected by academic in-fighting.

None of these problems would be of interest outside academia if they were not allied to two dangerous weaknesses at the core of the current theoretical focus on writing and language as process. The lesser of these weaknesses is the fallacious assumption that undergraduates can be made to understand the profoundly complex and vexing questions involved in the analysis of how language works. Linguistic and pedagogical theories are difficult enough for faculty; how can we expect our students, who now arrive in the college classroom with only marginal reading and writing skills, to reap anything but utter confusion from theoretical positions, however closely argued? The more dangerous weakness is the noticeable tendency to translate theoretical debate, in the classroom, into a license to ignore the essential function of the written language as a practical and useful product.

If we persist in regarding writing only as process, then we must logically abandon the principle of error, since errors can only occur in relation to a fixed standard for the end product; if we regard language only as a series of signs, then we must also abandon the concept of meaning, since meaning must also relate to fixity in order to submit to definition. Yet the users of the language, those whom we claim to have enlightened with an understanding of the process, find that in the real world writing is undertaken for a specific purpose in order to achieve a finished product, on the valid assumption that its meaning will be understood by its particular audience. If we insist on questioning the validity of error, or rules, or meaning, to the exclusion of all other co' iderations, what use are we to such writers? To argue that the admission of error, rule, and meaning constitutes a return to the old prescriptive theories of grammar and style is a gross over-simplification; no honest field of inquiry can be so reduced to an either/or proposition. No wonder confusion reigns; no wonder we meet resistance from all sides. While taking pride in our borrowed scientific methods, we have forgotten the warning we gave to the scientists; it is now we who murder to dissect.

The warning implicit in these two seminars is clear: if we cannot teach writing as an effective means of communication, someone else will. Someone else, in fact, already is: all of the industries represented in the second session operate extensive in-house writing programs. And more will follow.

The real wolf is at the door, but in our increasing isolation from the world at large, the working world into which we send our inept graduates, we do not see the danger.

I can already hear the cries of those who see only sweetness and light within the university walls, and I will be the first to admit that there are exceptions. There are effective and coherent writing programs; there are graduates who have been well taught and who, as educated men and women, put their knowledge to good use; there may even be, somewhere, enthusiastic and receptive freshman English students. Certainly there are scholars and critics whose work is a joy and an enlightenment to us all. But if these paragons were in the majority, why is there still so much concern over the problem of creeping illiteracy?

The university faculty of course does not carry the whole burden. We exist in a culture which does not value intellectual enterprise, which still distrusts abstract ideas, and which prefers its art in the form of craft. In such a context, the public school system's labelling of reading and writing classes as "language arts" is more ominous than anyone has so far noted. And we receive from that same school system most of our students, undereducated and disadvantaged from the beginning. But, however we may wish to hold ourselves apart from that general disaster, it is we who teach their teachers. We contribute our share to the problem.

As an academic trained in literature, I would like nothing better than to go back to the old way of teaching writing by teaching our students to appreciate and to love the best of the world's literature. As a person with a decade of business experience, in between degrees, and as a teacher of composition and technical writing, I don't think such an approach would work with today's pragmatically-minded student population. Our students will be interested, initially, only in acquiring those skills they can be convinced that they need.

The solution is offered in the papers presented in the joint seminars: the speakers from industry tell us exactly what writing skills their employees need; the professors of technical writing tell us exactly how to teach these skills. The larger implication may be not that we need more technical writing classes but that all composition courses should be taught as technical writing. Anyone who has taught freshman composition knows the dismay of facing that wall of resistance semester after semester; anyone who has moved from freshman composition to technical writing knows the delight that accompanies the discovery that students do respond to clear rules of style and grammar in specific writing assignments which they can achieve and for which they see a reason.

Any program which turns college composition away from essay discussions of abstract ideas within disembodied formats toward a concrete skills course will require cross-curriculum planning and cooperation. All faculty must indeed be convinced that adequate writing should be a fundamental requirement in all disciplines. Given such cooperation, we can teach our students how to write essay answers for history exams as well as critical papers for literature classes, how to write lab reports, trip reports, reports for the social sciences, how to conduct academic and non-academic research, how to write application letters, inquiries, requests, various business reports, and the like. The basic elements of effective writing will cease to be abstractions, of interest only to English professors, and become instead clearly useful techniques. When the emphasis in teaching composition shifts from process to product, and when the product is achieved, students respond. Imagine, if you will, the possibilities which open for the English department that creates students responsive to the language.

Should we then abandon all research? It would be absurd to do so. Our professional responsibility is to push for new ideas, new knowledge. The theoretical debates are stimulating, mind opening, and full of promise. But they are only part of what we do; our other responsibility is to our students, to preserve and to pass on to them our literary heritage and our language. There is no reason we cannot hold to two purposes, equally well; they are contradictory only if we confuse one with the other.

TECHNICAL SNOBBERY VERSUS CLEAR COMMUNICATING

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It has been 27 years since my last college English course at Texas A&M. Completion of that course was one of the happiest events of my college career. No more grammar. No more literature. No more book reports, compositions, or 500-word themes. I could concentrate on the important courses: mathematics, aerodynamics, aircraft structures, wind tunnel testing, aircraft performance, stability and control. My fellow aeronautical engineering classmates shared these feelings. True, we still had to write one or two technical reports each semester, but they were graded solely on technical content, not grammar. They did not have to be literate.

In 1953 we believed aeronautical engineering to be the pinnacle of technological sophistication. We looked down our noses at mere civil and mechanical engineering students. The Economics, History, and English departments would have been beneath our notice altogether had they not distracted us from our quest for more important knowledge. We reveled in our jargon and impressed lesser mortals with such words as "pressure coefficient" and "dynamic lateral-directional instability." That means "Dutch roll", we explained. We were careful not to explain things too simply, however, because then others would understand too, and wouldn't realize how smart we were. Nicholas Vansberg explains[1]:

> "Any ambitious scientist must, in self-protection, prevent his collegues from discovering that his ideas are simple . . . so if he can write his publications obscurely and uninterestingly enough, no one will attempt to read them but all will instead genuflect in awe before such erudition."

The snobbery continued after graduation. We were disdainful of non-technical support people in industry, especially technical publications people. How dare they suggest changes to our reports. We were the experts.We resented their gall and protested that their suggested changes compromised the subtle meanings of our torturous grammer.

Over the years, however, my career has changed. I am no longer personally involved with engineering duties, but solely concerned with communicating the technical ideas of engineering specialists to management, non-technical people, politicians, media, and lay audiences. Now that my job is technical communicating, I recognize it when this technical snobbery is directed against me: just deserts, no doubt.

Others recognize the effects of misunderstandings which may arise when technical ideas are not communicated clearly. While aerospace engineers were patting themselves on the back at their seminars on the grand technological triumph of the U.S. supersonic transport, a medical doctor in Arizona announced that the SST would cause skin cancer. The technologists had yet to learn that the Washington Post, the Los Angeles Times, and the Dallas Morning News do not sell news; they sell newspapers. The skin cancer headline sold more newspapers than the engineers' boring equations and the SST was killed; not because it would cause skin cancer -- which, as it turned out, it would not -- but because a misinformed public feared that it would cause skin cancer.

John McGrath of McDonnell Douglas Corporation, builders of military fighter aircraft and commercial airliners for most of the free world, said[2]:

> "Sound engineering depends on straight thinking and plain talk. That does not mean things will be simple. It does mean the less than simple especially demands clear exposition. To lead society, this field needs every engineer writing simply and directly, as our founding fathers did."

William H. Gregory, Editor-in-Chief of Aviation Week & Space Technology magazine, the weekly "bible" of the aerospace industry, commented on the forced retraction of one of U.S. Senator William Proxmire's (D-Wis.) notorious Golden Fleece awards.(Senator Proxmire awards "Golden Fleeces" to government organizations and individuals in order to call attention to expenditures which he believes "fleece" the taxpayer for unworthy projects). This time, however, he was forced to retract the award when the recipients, the National Science Foundation, the National Aeronautics and Space Administration, and the Office of Naval Research finally explained clearly the nature of their joint study. Mr. Gregory wrote in his editorial[3]:

> "The scientific community has brought part of its Golden Fleece trouble on itself by its incomprehensible jargonistic titles and (the) esoteric subjects of some of its research programs."

Robert Gunning, who gave Clear Writing Clinics for hundreds of corporations, said[4]:

> "Business writing is more complex than that in the Atlantic (Monthly Magazine), not because it has to be, but because it is heavy with fog, which tires and confuses the reader without telling him anything. Good writing, on the other hand, is free from this useless complexity."

Engineering is not the only profession guilty of communication depression, verbal inflation and jargonitis. Every profession has its own unique terms. Edwin Newman, NBC newscaster and staunch defender of correct English usage, asks[5]:

"Why is such language used? Self-importance, of course, but also because it serves as a fence that keeps others outside and respectful, or leads them to ignore what is going on inside because it is too much trouble to find out. For those inside, either effect is harmful. That is why psychologists will not speak of someone as independent or self-reliant. They will say that that person has a high personal autonomy quotient. A librarian won't say that he offers many services but multifaceted services. The Chief of Police in Madison, Wisconsin, spoke of the jail as a total incarceration facility . . ."

Jargon is not always bad: Used properly, it defines precisely and concisely the concepts peculiar to a profession. Within a profession, it meets the criteria for clear, brief, specific communication. When used outside that profession, however, it tries to impress rather than to express, but it only repulses. The point is that engineers and other profesionals need to be taught when to use jargon, and when not to.

Even while people criticize others, they commit the same sins: Nicholas Vansberg used the words "genuflect" and "erudition"; John McGrath used "exposition"; and William Gregory used "esoteric." These words, familiar to any English professor or writer, are as uncomprehensible to most engineers as their own "unsymmetrical dimethyl hydrazine" is to you.

Another problem is acronymania, for which the U.S. Government must surely win the prize unanimously. And acronymania is highly infectious. An aerospace company office memo reported[6]:

"Inquiries to CNAP staffers to determine rationale for award of AFC-604 in RF-8G to NARF NORIS vice VSC have received a vague response."
I don't doubt that for an instant!

On the other hand, if we said "self-contained underwater breathing apparatus" each time we wanted to scuba, we might not have time left to do so. Scuba, like radar, laser and snafu, is so widely known that its original definition has long been forgotten.

Clearly, there is a time, a place, and a use for complex terms, acronyms, and jargon. The student must learn where such usage is appropriate, as well as how to express himself clearly and correctly, both when using these terms and also without using them.

As a student, and for many years after graduation, I did not know how to express my technical ideas without using these terms. In fact, the thought never even occurred to me that I should try. All of my associates were engineers; they understood because they thought and talked and wrote just as I did. My basic problem, I now realize, was that I did not understand the actual product of an aeronautical engineer. I was full of bright-eyed wonder over the mystique of aeronautical technology, and never doubted that my product would be aircraft.

In 24 years of work in industry, government and academia, I have given 42 talks, speeches and formal briefings, not including course lectures, and published 54 papers, articles, test plans, and reports, totaling over 2500 pages. Additionally, I have participated in innumerable meetings, informal briefings, discussions and arguments, but I have not cut one piece of metal for an aircraft. I have not installed a single actuator, control surface or indicator. My product is not "aircraft" and never has been. My product is "information."

And I know of only four things that can be done with information; it can be used by its creator, stored, shared, or forgotten.

Few companies will long pay an employee to create information and keep it to himself. Even if the employee uses the information himself, sooner or later he must communicate it to someone or write it down. He must "sell" his ideas to his boss in order to get money, equipment, facilities, people, or time to explore or develop those ideas. There are enormous predatory forces in every organization continually preying on every project -- seeking its money, equipment, facilities, people and time. The employee must continually defend his project and ideas by effectively communicating with his management. The frequency and extent of these oral and written communications depend upon the employee's particular responsibilities, and their success depends solely upon his communicating skill.

Dr. Pearsall reported[7] the results of a survey[8] of some people listed in "Engineers of Distinction." Respondents spent an average of 24% of their time writing plus 31% of their time working with other peoples' written materials; less than half of their time was spent actually "doing" the engineering "things" they were trained to do.

The engineering student must be made aware that his product will be <u>information</u>; not aircraft, or spaceships, or engines, or suspension bridges, or automobiles, or nuclear power plants, or computers. If he fails to grasp this fact, his career development and his value to an employer and to society will be limited.

Many people fail to identify their product correctly and suffer the consequences. Theodore Levitt, in the Harvard Business Review[9] argues that every major industry was once a growth industry. In every case where growth was threatened, slowed, or stopped it was not because the market was saturated, but because management failed to define the company's product correctly. He writes:

"The railroads did not stop growing because the need to transport passengers and freight declined. That grew. The railroads are in trouble today not because the need was filled by others...but because it was not filled by the railroads themselves. They let others take customers away from them because they assumed themselves to be in the railroad business, rather than in the transportation business. The reason they defined their industry wrong was because they were railroad-oriented instead of transportation-oriented; they were product-oriented instead of customer-oriented."

Mr. Levitt identifies other erroneous product definitions; Hollywood thought it was in the movie business when it was actually in the entertainment business, and many studios were decimated by television.

Years ago I defined my anticipated product wrong because I thought I was in the aircraft business instead of in the technical information business. I was not prepared for the technical information business because my Engineering professors also thought they were in the aircraft business, and my English professors thought they were in the literature and rhetoric business. Consequently, both departments failed to teach me how to communicate complex technical information clearly. And their omission was all the more insidious because I did not recognize it as a failure until more than five years after graduation.

How could I have been better prepared for my future business of developing and communicating technical aeronautical information? One way would have been to learn on my own. Plenty of self-help is available. For example, John Walter suggests[10] a self-help program to prepare literature-trained English teachers to teach technical writing. He suggests:

"...self-help, primarily through reading; attendance at professional society meetings devoted to technical writing; attendance at seminars, symposia, and institutes devoted to the teaching of technical writing; internships; and, if possible, the taking of graduate course work in teaching technical writing."

This would be beneficial but self-help has two basic problems: First, there is the danger of "preaching to the choir" and, second, there is a complete vacuum of feedback on student development.

If not through self-help, then how might my Aeronautical Engineering and English departments have taught me to communicate technical ideas effectively? Individually, neither was capable of the task. Engineering students who are not taught to communicate effectively sometimes grow up to be Engineering professors who cannot communicate effectively o teach their students to communicate effectively. English professors understand composition and communication, but cannot practicably include the necessary realism of complex technical content in their technical communicating courses. Any attempt to do so would generate a roar of thundering resentment from the technical students. If neither department is individually capable, then what is the alternative?

I suggest a joint program coordinated between English and technical departments. Perhaps one freshman English course to cover the basics of clear written and oral communicating, and the emphasis which effective communicating will receive in subsequent technical courses. These technical courses could include participation by specially trained technical communication specialists from the English Department. These communication specialists, working harmoniously with the technical instructors, would be responsible for helping the students to develop good oral and written communications skills. Up to one letter grade would be subtracted from a technical course presentation, report, or paper for grossly inferior communicating. Appropriate corrections and constructive criticisms would be made for all oral and written technical work. The student might rebel at having two instructors for each technical course. Actually, this would increase the subject realism, and it would not be the last time the student will have more than one boss to please.

Constant emphasis is essential for development of correct and effective communication skills. It takes more than a single three-hour course to supplant a lifetime of playground jargon and television trivialogues.

James Souther has made an excellent start on technical communication course content[11], but the program needs more customer definition and emphasis. We must identify our customer correctly in order to identify our product correctly.

The first impulse is to identify the student as the customer -- he has in essence hired the instructor to teach him the course material and evaluate his progress.

I suggest, however, that the real customer, to whom we should tailor our product, is not the technical student in our classroom, but the ultimate user of the information developed by the technologist. Such a customer definition frighteningly expands the criteria to include effective communication with businessmen, lay groups, media, politicians, and hostile citizens' groups. In fact, the very people upon whom the technologist is ultimately dependent for tolerance, support, acceptance, and funding of his projects.

I suggest also that we define our proposed product to be "technical communicating". If our objective is "technical writing", then, once we have written, our job is done. If our objective is "technical speaking", then once we have spoken, our job is done. But, if our objective is "technical communicating", then our job is not finished until we have communicated accurately with our readers or listeners. If they do not understand our points from our point of view, then we have failed to communicate.

This conference cannot possibly solve the problem, but it could define the criteria for the solution. Therefore, I propose we agree that:

- Our customer be defined as the ultimate user of technical information, whoever that might be;

- Our product be defined as the clear, concise communicating of technical information to that customer, and that

- We endorse close cooperation between college and university English and technical departments.

This would be a small step for this conference, and a giant leap for technical communicating.

And, speaking of giant leaps, former astronaut, Senator Harrison H. Schmitt (R-N.M.), in a briefing to the Institute of Electrical and Electronic Engineers on his plan for a new U.S. space policy, said[12]:

> "What does it take for Americans to do great things: to go to the moon, to win wars, to dig canals between oceans, to build a railroad across a continent? In independent thought about this question, Neil Armstrong and I concluded that it takes a coincidence of four conditions, or, in Neil's view, the simultaneous peaking of four of the many cycles of American life.
>
> First, a base of technology must exist from which the thing to be done can be done.
>
> Second, a period of national uneasiness about America's place in the scheme of human activities must exist.
>
> Third, some catalytic event must occur that focuses the national attention on the direction to proceed.
>
> Finally, an articulate and wise leader must sense these first three conditions and put forth with words and action the great thing to be accomplished..."

Surely, we have the ability to improve the quality of our technologists' communicating. Surely there is a widespread uneasiness about the present state of technical communicating. Surely, no one could doubt the catalytic value of the misinformation rampant about nuclear power plants and the energy crisis.

If only we had a wise and articulate leader...

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12. Senator Harrison M. Schmitt (R.-N.M.), before the Institute of Electrical and Electronic Engineers, as reported in Aviation Week and Space Technology, September 25, 1978.

# 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 <u>the importance of clear writing</u>. 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," <u>J. Tech. Writing and Communication</u>, 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 procedure. 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

(1) Literature references serve a rather obvious purpose in any kind of technical paper: they show what others have previously done and published. (2) One 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. (3) Still 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.

(4) The 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. (5) To know what has already been published in your field is, of cource, a great advantage. (6) But findings and using the references is by no means a routine matter--indeed it has many pitfalls. (7) Frequently 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. (8) His 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.

# TECHNICAL WRITING VS. TECHNICAL WRITING

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I don't usually admit this in public, but I am a "technical writer". The term has become so generalized, representing so many types of writing and so many job functions, that few professionals wish to be called "technical writers".

Some basic definitions contribute toward our defining these various types of technical writing. According to accepted usage, an "author" originates written materials and/or practices writing as his or her profession; a "writer" writes as an occupation. To "edit" is to make written materials presentable for publication or presentation, but an "editor" supervises the policies or production of a publication. And, lastly, "technical", deriving from and pertaining to "technique", refers to a systematic procedure by which a complex or scientific task is accomplished. These definitions begin to help us clarify the various roles, but they do not yet make explicit the job functions and levels.

Given those definitions, let's examine the term "technical writer". Most often in industry, a "technical writer" has a working knowledge of technology and his/her job level is considered occupational rather than professional. He or she usually has enough technical knowledge to be capable of rearranging material others provide, but not enough to be capable of originating materials. Then what about the person who is considered a professional and who originates written technological material? We need to coin a term for this person, perhaps "technical author".

These two definitions point to the reasons the term "technical writer" has poor connotations for many people in industry. The line between the two is very fine: no black and white distinctions, just many shades of gray. There are many of us who are in fact, in Joe Rice's term, "closet technical writers" (ref. 1).

I once refused a job because it carried the title "Technical Writer". After a discussion with the manager, I accepted the job under a different title. New title--Engineer Scientist III. The same pay, but the title "Technical Writer" would have marked me and, more importantly, it would have been detrimental to me in later assignments with other companies. In that job, I was to originate technical materials; the company was hiring me for my technical expertise. I was, in fact, a technical author.

Many titles are used to circumvent this problem: "engineering writer", "specification writer", "technical communication specialist", "technical publication specialist", "proposal management specialist", and so on. All of these people have at least one attribute in common; they are all capable of originating material. They are all, in fact, technical authors. Salaries in this category are much higher than those for technical writers. Industry pays for technical expertise combined with communication skills.

When technical students, for example in engineering, graduate from the universities, do they have the communication skills they need for this role in industry? Rarely. Industry usually has to train them. What about English or journalism majors who take a course in technical writing and go to industry for a job. What are their capabilities? I think, by our earlier definitions, most of them are qualified to edit--to make material presentable for publication or presentation. My experience in industry has shown me that of the two degrees, journalism is the more useful, and journalism students are generally the more successful because of their design skills and, particularly, their familiarity with interviewing techniques. English majors, however, are almost always the better writers. Some of the recent Technical Communication graduates have both skills and are more correctly "technical editors" than "technical writers".

How well prepared is an English or journalism major for a job as an editor? Mary Fran Buehler's discussion of some types of edits, as they are performed at Jet Propulsion Laboratory, (ref. 2) not only articulates the types of edits but also implies some of the skills required to perform those edits:

Putting a publication through the various production processes, monitoring progress, making out the necessary paperwork;

Making sure that the publication reflects company policy;

Making sure that the parts of the publication match in a physical or numerical sense, and that every element mentioned is actually included;

Giving a minimum-level language and graphics review to camera-ready copy to ensure that the quality is suitable for external publication;

Clarifying illegible copy;

Marking a manuscript with format instructions for the compositor or illustrator;

Assuring appropriate and consistent usage of such mechanics as capitalization, abbreviations, reference style;

Giving the manuscript a complete in-depth language review;

Reviewing the manuscript for content coherence, emphasis, subordination, and parallelism.

To be able to perform and supervise all these functions is to be an editor. I realize there are editors who cannot do so. Do English or journalism majors, at graduation, have the necessary skills to perform these functions? Not usually. Industry has to train each of them, and it can take several years before they are proficient.

But to the listing of editorial functions (and, hence, types of editors), I would like to add one other category: the "technical editor". I realize there are people in positions carrying the title of Technical Editor who have no technical knowledge, but this is not the norm. The proficient technical editor can write, can perform the policy-making tasks of an editor, and he or she has a working knowledge of technology. To achieve the skills needed for this function, industry can provide the training, or the editor can go back to school for some technical education. Technical editor salaries are traditionally higher than those for editors and technical writers.

Industry needs people in all four categories; however, the greatest need is for technical authors and technical editors. Industry managers literally cannot find enough of these people.

What kind of program would prepare students for these jobs? What would create an effective technical writing program? Most of us, I believe, understand the principle of training: You take a student and determine his or her existent knowledge and skill level. Then you determine your goals--the skills and knowledge you want that person to have. Once you have determined these two, you supply the parts that lead from the former to the latter.

Obviously, this formula is too simple; it is laden with problems. Problem 1: The skill level and style of learning of a technical student is different from that of a liberal arts student. Most engineering/science/math majors concentrated on and were shaped by math and science in high school--after all, that is their main interest. They took only the required communication courses and did only enough to get by. On the other hand, most English and journalism majors avoided math and science courses and concentrated on, and were shaped by, literature, jounalism, etc. That too is understandable--these are their interest areas. The problem here, then, is in assuming the initial level of all students to be the same.

Problem #2 is in determining our goals--what we want from these people. What we want is two different sets of skills--technology and communication--with some overlap, of course. The skills required of the technical editor and the skills required of the technical author are not wholly the same. Therefore, the university preparation of the technical editor and the university preparation for the technical author should not be wholly the same. Potential technical editors do not need the heavy courses in math and design; they do need courses especially designed to teach the general principles and terminologies. Potential technical authors need some communication preparation different from that of technical editors. Industry has been providing that training for years. I hope the trend is changing toward the universities providing more usable preparation; it appears to be.

To illustrate the training needed for communicators in industry, let me relate a personal experience. As a consulting engineering writer, more than ten years ago, I was on an assignment to write a manual on an Atomic Frequency Standard (a highly accurate instrument used to calibrate precision electronic test equipment). I had what should have been sufficient skills: adequate technical knowledge and about five years' engineering writing experience. I soon felt those skills to be marginal when I discovered that I had to explain some Quantum Mechanics theory to a technician reader, a high school graduate. I had to lower the reading level without losing the technical accuracy. The Army specifications called for an 8th grade reading level. I didn't know how to measure reading level. And I surely didn't know if it were possible to reduce Einstein's third law of photochemistry to 8th grade words.

What I finally did was bribe (out of my own pocket) a military electronics technician (with a fondness for alcohol and food), who approximated my intended audience, into reading and responding to the copy. We spent hours in long discussions while I found the words and explanations that would reduce the content to 8th grade vocabulary and searched for the analogies that would make him--and my intended reader--understand the content. Throughout the discussions, the deadline loomed.

After 13 weeks, I produced 150 finished printed pages. I had written seven drafts of the 40-page theory section, so in actuality I had written 390 pages but produced only 150. Forty hours a week for 13 weeks translated to something more than 3.5 hours per page, which is within industry standards. I had, however, actually spent another 700+ hours of my own time, which brought the actual rate to nearly 8 hours per page. That is not within industry standards, and I considered it unacceptable.

My client and his customer were impressed with the end product. I was not. I could not stand that pace or frustration for long and decided that if I were to continue in this business, my existing writing skills were not sufficient. So I left an excellent paying job, enrolled at a local university, and signed up for various English and journalism courses. I had courses in composition, courses in writing about literature (called composition), technical writing, creative writing, reporting, magazine layout and design, and several literature courses. I wrote newspaper articles. I wrote entertaining (probably only to me) articles. I compared and contrasted styles of various writers and poets. I read The Odyssey, The Iliad, Sophocles, Eumenides, Euripedes, various pieces by Plato and Aristotle. I loved it--and still value that knowledge, but I still didn't have what I felt I needed.

Somewhat frustrated, I went to an advisor in the English department. After a two-hour session, her advice was, "Maybe you should give up trying to be a writer. I just don't think you have the ability. The courses you've taken should have created the skills you're seeking." That left me confused. I had been very well paid as an engineering writer prior to returning to college. In college, I had made the Dean's List every semester, so I had obviously worked hard and learned what I was supposed to have learned. But she was telling me I didn't have the necessary ability.

I finally figured out that the theory that one learns to become a writer by learning to appreciate literature is analogous to the idea that o learns to become a gourmet chef by going to the really fine resturants and arning to enjoy the different foods. Maybe I'm wrong, but I think that all u become is a fat connoisseur.

In all those courses, no one had mentioned hueristics, audience analysis, communication theory or rhetoric th ry, and I still thought "epistemology" was a dirty word. It was another five years before I found the right people (outside the college classroom) to introduce me to the work of Young, Becker and Pike, Bateson, Kenneth Burke, Jim Corder, Bob Hopper, Tom Pearsall, Jim Souther, John Walter, and others; and before I could then discover just how much Aristotle and Plato really did have to offer.

Now, there are more innovative writing programs. I am still not convinced, however, that sufficient progress has been made. Recently, for an engineering writing job, I interviewed a bright young engineer, a 1980 graduate with a 3.8 overall GPA, with two English composition and two technical writing courses on his transcript. When I asked him about invention and audience analysis, he looked blank. He did know that Aristotle was a Greek. He had not heard of the Society for Technical Communication, The Society of Logistic Engineers, or the International Association of Business Communicators; he had made application to IEEE.

What can we do? How do we teach the technical and scientific students how to write effectively for business and industry? How do we teach English and journalism students the skills necessary to become technical editors and technical writers?

I think the key is closer alliance between us; it is time for industry and academia to join together to better meet the needs of both. We need to form advisory panels which include representatives from both industry and the universities. We need the university faculty to have some industry experience and to invite some industry people to teach parts of courses. We need industry to become more aware of your problems and constraints and to invite you to share in what we do. We need faculty members to join some of the professional technical societies, and we need industry people to join some of the professional academic societies. Together, we need to enlarge the common area in Schramm's communication diagram. It is time for both groups to get out of the dining room and into the kitchen.

How can you in the classrooms help us in industry to contribute to our joint goal? You will have to articulate more clearly the definition of the product you are producing. I believe both the term "technical writer" and most technical writing courses are too general and too loosely defined to accomplish this objective. Who or what is your audience? If you cannot define the audience, you cannot define the product. If you cannot define the product, you cannot produce it. Produce technical and scientific graduates with good technical skills and competent technical communication (especially, writing) skills, produce editors/writers with good technical communication skills and competent technical skills--and you will have industry beating a path to your doors.

I am heartened by what I see happening in some current writing programs. I believe we are starting to see the light at the end of the tunnel. I do hope it's not another train.

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# WHYS AND HOWS OF IN-HOUSE WRITING

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I regret that I must write my contribution to this panel rather than participate in person. This is particularly regrettable because I have not had the opportunity to hear the related panel this morning and the present panel's other participants this afternoon. Thus, I may overlap or seem to ignore important points m... in both panels. If so, please excuse me -- it will be inadvertent.

To get as much into the spirit of this discussion as is possible from 1200 miles away, I've studied the abstracts submitted by the panel's other members. From time to time, I'll comment on some of their ideas.

I suppose there's no maxim that doesn't have an invalidating exception. Nevertheless, I'm going to advance one formulated by the late Norman Shidle years ago, when he was editor of the S... Journal. The SAE, of course, is th Society of Automotive Engineers -- ...a, although engineers aren't supposed to be able to write, has long managed to be articulate, if not literate.

Norm's maxim is, and I quote verbatim: "Clear thinking must precede clear writing." He maintained, and so do I, that the best writer in the world can't write clearly about something he doesn't clearly understand.

We can combine the requisite technical knowledge with the requisite writing ability in only two ways.

1. We can teach engineers to write, <u>or</u>
2. We can teach writers to engineer.

Of the two, I believe it is easier to teach engineers to write. So that's what I do.

I agree wholeheartedly that in-house courses are not the only way to accomplish the task. The earlier you catch the little devils, the better the training will stick. And that, I believe, is part of the reason why so much in-house training is needed today. The job just didn't get done earlier.

Grammar-school teachers, years ago, used diagraming and syntax to teach coherent sentence building. They also taught their little charges to outline before starting to write. To some extent, anyway, the outlining step provided the clear thinking that must precede clear writing.

Then came the progressive, free-expression, era that believed one way is as good as another. Reading was taught by the look/say, whole-word method. Students could no longer sound out a written word to determine if they had heard it before. As a research professor at Georgia Tech in the early 1950s, I had graduate students working for me who couldn't recognize the names of chemicals that they could step into the lab and synthesize with ease.

High-school English teachers largely ignored composition, because study of contemporary writing styles was more fun -- and a great deal easier -- to teach. "Me now, I just wanna be a catcher in the rye or a lord of flies."

College composition courses were taught by English teachers on the Liberal Arts side of the university. Matriculating engineers were given qualifying tests that might opt them out of such "time-wasting" courses -- as, indeed, I was.

In those days, the saying was: "Writers are born, not made." And, I submit, that was because few teachers, if any, knew how to make a writer.

Then, in the 1940s, two curious men asked what makes writing clear or unclear? Why do some writers make even simple ideas hard to understand? And why can others make very complex ideas reasonably understandable even to laymen?

One of the questioners was an Austrian refugee, Rudolf Flesch, who came to this country not knowing how to speak or write English. He taught himself how to speak by going to the movies and matching the visual action with the sound track. In other words, he learned the English language the same way all of us here learned it -- by osmosis. He literally absorbed it -- which is no small trick when you're already grown up.

The other questioner was Robert Gunning, who went to work for a Columbus, Ohio, newspaper after being graduated from Ohio State University. As a reporter whose writing was extraordinarily clear, he was asked to contribute items to a most unusual new newspaper. It was named "My Weekly Reader," and its aim was to bring worldwide news to junior-high students and, thereby, stimulate their desire to read -- in other words, to give them something to read above the Dick-and-Jane or Bobbsey Twins level.

A few newsmen, like Robert Gunning, could write clearly for teens and subteens. But most could not. Gunning wondered why not. In another part of the country, and from different background and experience, so did Rudolf Flesch.

Within a year or so of each other, both men developed readability indexes. They analyzed the parameters that make writing unnecessarily complex. Because of its simplicity and its computer-proved relationship to the years of schooling required to read with comprehension, Gunning's Fog Index formula has been more widely adopted than Flesch's formula. In fact, it has become a very useful yardstick for determining whether a piece of writing is unnecessarily complex.

Do sentences ramble on and on, without the pause of a comma or period, so that the initial idea is forgotten before the final idea is proposed? To avoid this, Gunning made average sentence length a prime parameter in his Fog Index.

The other prime parameter is use of unfamiliar, complex words. Why, as Mark Twain said, write "metropolis" when I get paid the same for calling it "city"? The same, of course, goes for "approximately" versus "about"; "characterize" for "describe"; "proximate" for "near"; "diminution" for "drop" or "decrease" -- and any number of other multisyllabic pompposities for more familiar synonyms.

Some people write to impress rather than express. Usually, this shows through, and the impression is unimpressive.

One of Gunning's ten principles of clear writing is "Relate the complex to the simple." An example might be electric voltage and current, which nobody can see, to water pressure and water flow. If one wants to express how large a "black hole" in space may originally have been, he might try comparing it with the diameter of the sun, which all of us see every day.

O, there are many ways of teaching writing. And I maintain that most of them have been ignored in recent years by English teachers trying to educate the scientifically oriented people who will develop and guide our technological progress in years to come. That's really not the English teachers' bag, and they probably shouldn't be saddled with it.

So who should do the job? If it hasn't been done before the graduates are cast out into real life, then business and industry must supply what the educational system has not.

That, very briefly, is the case for in-house training. If the educators haven't done the job, the employers must.

Out of my own company's need in the early 1950s, I sought out Robert Gunning at a hotel symposium he was conducting in Cleveland, Ohio. Hundreds came, one or two men per company, to take Gunning's one-day course in major metropolitan areas around the country.

What we wanted at our Laboratories was to train scores of researchers to report their results clearly and concisely. At two or three hundred dollars a researcher, in the hotel format, that would have taken years and cost a fortune.

So we asked Gunning if he would come to Detroit and give his course in-house to all of our people who needed to communicate in writing. He agreed, and together we set up what was either the first or one of the first of his in-plant courses.

Over the years, we came to realize that Fog Index and the Gunning ten principles of clear writing still left us somewhat short of truly effective communication.

One major problem was <u>thought organization</u> -- something Gunning didn't much consider. An important corollary was <u>determining the primary audience</u> and its particular needs and non-needs. To whom are you writing and why? What do they already know? What more do they need to know? How do I best relate what they need to know to what they already know? And how do I avoid confusing them by telling them more than they need to know?

These are questions, I believe, that most college and university people have not asked themselves. Therefore, we employers have been forced to ask ourselves. The results have been in-plant training courses. We don't do it to put English teachers out of work. We do it because the job hasn't been getting done.

One problem has been that the neophytes never bring the payoff bottom line up front in the reports of their efforts. I think they got that way because of their education, not despite it. And the fault lies not with the English faculty, but with the technical faculty.

Consider what a technical-faculty member looks for in his students' reports. The prof probably has been assigning the same laboratory experiments to successive classes for years on end. His purpose is to instill experimental abilities -- not to obtain an answer he already knows. Therefore, as his students soon perceive, the way to get an A is to report chronologically -- and in detail -- every manipulative effort and technique employed, step-by-step, in conducting the experiment. At the end -- and only at the end -- do you divulge the result.

Then the students graduate and are hired by result-oriented companies. Their abilities to conduct experiments and employ scientific techniques are tacitly assumed from their degrees and resumés. Now the emphasis is on results. The bottom line of their college reports now is of top-line importance. Somebody, somewhere, has to convince them that the way to earn an A has shifted 180 degrees. Of necessity, this part of their education has fallen to the industries and businesses that employ them. You can send them out to remedial courses, or you can do the job in-house. Of the two alternatives, in-house usually is better, faster, and cheaper.

Very briefly, that's the case for in-house training. It supplies what hasn't been supplied by academia -- at least up to now. I think it can be supplied in school. But to do so, teachers are going to have to consider the real-life needs out there -- consider what employers need and want, not what the faculty has been awarding with A's.

This leads me to ask where the snobbery that Mr. Ransome alludes to really lies. Is it in the engineer who is unwilling to communicate, or is it in his writing mentor who believes the engineer can't communicate. Believing that engineers have hairy ears and suffer from tunnel vision and intellectual snobbery is a gross misinterpretation. Truth is, they just don't suffer fools willingly. The savant who comes along and tells them they are saying it all wrong had better be sure he knows how to say it right. "Clear thinking must precede clear writing."

That is why I believe that the teachers of technical writing should be technical people, themselves, preferably with working experience in industry or business. The training they provide must be user-oriented, need-oriented -- not theory-oriented.

In the abstract of his talk here today, Dr. Smith said the student should be taught to use words precisely rather than quote "writing like he talks" unquote. Personally, I fail to see how, why, or where those two techniques are mutually exclusive. A person brought up in a home of reasonably educated parents learns to speak well before learning to write at all. And the clear thinking that must precede clear writing is done in the brain, not on paper.

Gunning's ten principles of clear writing include "Develop your vocabulary." The reason is not so you can use the word "paradigm" when you mean "example" or "rhinitis" when you mean the common cold. Gunning believes that the more words you know, the more clearly and precisely you can think. When you have completed the clear-thinking step, you then translate your precise thoughts into the simplest, least complex verbiage for the broadest, least specialized audience you wish to reach. ... To do less than that is, in itself, a kind of intellectual snobbery.

Einstein once was asked for a thumb-nail explanation of the theory of relativity. His answer went something like this: "When a man sits on a hot stove, a minute seems like an hour. But when he sits on a swing with a pretty girl, an hour seems like a minute. It all depends on where you are. That's relativity."

With that as an example, and in the interest of keeping things reasonably brief and to the point, I now conclude. I send you greetings and best wishes from Detroit, and I sincerely regret that I'm not able to be with you today.

Panel E-16

# Designing Technical Writing Programs at Two-Year and Four-Year Colleges

# TECHNICAL REPORT WRITING IN THE COMMUNITY COLLEGE:

# AN INTERDISCIPLINARY APPROACH

Marilyn B. Silver
Delaware Technical and Community College

This paper describes the design and implementation of an interdisciplinary course in technical writing developed for dental hygiene students at Delaware Technical and Community College. While most college teachers do not teach dental hygiene students and many do not teach community college students, we believe that the DTCC plan--the why, the how, and the so what about our three-year-old interdisciplinary technical communication project--is relevant and applicable to a broad range of technical writing programs at two-year and four-year colleges and universities.

To support this assertion, I'll begin with the conclusion. As a result of using an interdisciplinary approach to the teaching of technical writing, we have found that many of our community college students are able to produce professional, technically-sophisticated writing assignments. We have some objective support for our belief in the success of our program because two of our dental hygiene students, with some additional help from the dental hygiene faculty, will be publishing the results of their studies in dental hygiene journals.

This paper offers background information about our college and the communication needs of our students, delineates our rationale for implementing an interdisciplinary approach and provides a model that can be adapted to technical writing programs at other schools.

## Why: Some Background Information About DTCC And Its Students

Most community colleges seek to meet the immediate and long-range needs of the communities in which they are located. Delaware Technical and Community College has offered a variety of programs adapted in subject, level and scheduling to the local community. While some of our students transfer, upon graduation, to four-year colleges, most complete technical, business and continuing education programs that prepare them immediately for the job market. Since the college was founded, some fourteen years ago, graduates from all four campuses have been highly competitive in a variety of technical and business fields.

The primary function of the English department at DTCC is to teach communication skills, although we do offer a few literature courses. Our program begins with developmental and remedial instruction in a laboratory setting. Technical Report Writing, RE 123, is the most advanced writing course in the program. It was supposedly developed to allow technology students to apply the principles of good writing and the genres of effective technical communication to specific assignments in their major fields of study. In practice, this was not always the case. Moreover, some of the problems inherent in our technical writing course are shared by other colleges and universities across the country (reference 1).

When I began teaching technical writing, the course was offered by the English department with relatively little input from the technical faculty or from employers. Students usually enrolled during their second or third quarter at the college, before they developed a solid grasp of their disciplines. Classes were large--up to 24 students--and heterogeneous-students from a wide variety of technologies were scheduled together in the same class. In an effort to meet the needs of disciplines as diverse as accounting, data processing, secretarial and human services, our assignments had to be quite general. Although students were encouraged to apply what they learned about the modes and genres of technical communication to their major fields, in practice, they were frequently at a loss to do so. Moreover, while technical faculty were asked to advise students about topics and approaches, their genuine involvement was limited and, frankly, not very helpful. Some did not believe that first-year students had learned enough technical information to write "worthwhile" reports. Others, with fifteen and eighteen-hour course loads, were too busy to be bothered with what they viewed as additional work.

The end result was that when I read my students' papers, I grew increasingly convinced that I was spending more time evaluating their assignments than they had spent composing them. Candid conversations with a number of students confirmed my suspicions. Many simply did not believe that good communication skills would be important in their choice of careers. Even those who accepted a major role for writing skills in the world of work ranked the need to learn these skills a low priority as compared with their need to learn technical information. Some of our most able technical students were not motivated to spend the time, energy and effort needed for sustained improvement in their communication skills.

At the same time, I noticed that students who performed well in technical writing frequently demonstrated at least some of the following characteristics:

(1) Successful students were usually second year students, close to graduation. They had delayed taking technical writing until they had developed a sure sense of their discipline and could use the course for professional development.

(2) Successful students were frequently enrolled in a technical writing class that was largely homogeneous or had a group of students from the same technology. These students were able to consult with each other and make recommendations about

specific approaches.

(3) Successful students were often enrolled concurrently in practicum technology courses or employed in the work-a-day world where they were required to complete technical writing assignments for evaluation by technical instructors and/or employers.

My interest in improving our technical writing program led me to conduct a needs assessment survey of the communication skills required of our graduates. After interviewing scores of employers, consulting with technical faculty and students, and enlisting their support and cooperation, I recommended a series of changes. In particular, I proposed that we move technical writing to the second year in all technology programs and that we establish a series of interdisciplinary models.

My rationale for recommending an interdisciplinary approach can be briefly summarized in the following four points:

(1) By using an interdisciplinary approach we would transcend artificial barriers of curricular design and reinforce each other in the classroom. Problem-solving writing strategies applied directly to technical subjects could help students increase their understanding of their disciplines and demonstrate that technical competence and communicative competence were inseparable.

(2) By using an interdisciplinary approach we would encourage students to write for a complex audience, one that more closely approximates reality than the usual classroom situation. Students would learn to make rhetorical choices appropriate to communicate with an educated lay-person (the English instructor) while not oversimplifying or distorting information for their technical professors (reference 2).

(3) By using an interdisciplinary approach we would allow students to move beyond elementary levels and apply rhetorical strategies to technically sophisticated work tasks because the technical professor would be available as a resource person. This would follow the recommendations of the <u>NCTE Final Report of the Committee on College English for Scientific and Technical Students</u> that students be given opportunities to work with complicated scientific data and that "the person grading the report must know the subject thoroughly in order to evaluate critically the scientific writing" (reference 3).

(4) By using an interdisciplinary approach, we would be helping to foster high interest, motivation and achievement on the part of students. Assignments required in the writing classroom would no longer be viewed as irrelevant or burdensome because students would be applying communication skills to immediate tasks in their technical disciplines.

Once I convinced my colleagues of the need for change in the technical writing course, a mechanism for implementing interdisciplinary approaches was needed. Successful interdisciplinary models had been described in the literature but they seemed to require extensive changes to ongoing programs. The development of tendem courses or the creation of joint faculty appointments, for example, made the implementation of an interdisciplinary approach seem very complicated indeed (reference 4).

## How: The Implementation of an Interdisciplinary Approach at DTCC

During the winter of 1978, the dental hygiene faculty agreed to participate in a pilot project. We decided to try a tailored approach to technical writing. The assignments for one section of Technical Report Writing were modified to meet the goals and objectives of the advanced technical course, Community Dental Health. As we developed our interdisciplinary model, we integrated the materials of two courses, but kept the courses distinct and separate. Students registered for both courses, attended class for both courses, and received grades for both courses. This procedure eliminated red tape, budget hassles and administrative interference, especially in the initial stages of our project. It also had another advantage. Because both teachers and both courses had equal status, I participated fully in the planning and development of all assignments.

Before the quarter began and periodically during the quarter, I met with the dental hygiene faculty to plan and coordinate efforts. In Community Dental Health, the instructor taught a rudimentary knowledge of biostatistics and epidemiology. In Technical Report Writing, I helped students master the strategies and forms required to communicate this technical knowledge with clarity and precision. Our approach gave students the benefit of an interdisciplinary course within minimum disruption of current practices. To implement our integrated strategies, we had students work on one major project in both their dental and English courses. For eleven weeks, they planned a program designed to solve a dental health problem in the community. Assignments for both courses culminated in a comprehensive final report.

To understand fully the methodology of our course integration and our success in tailoring technical writing to suit the goals and objectives of the dental hygiene course, it's helpful to understand the purpose of the Community Dental Health course. Dental Public Health, as defined by the American Dental Association, is "the science and art of preventing and controlling dental disease and promoting dental health through organized community efforts" (reference 5). At Delaware Technical and Community College, students focus on educational preventive dental programs working with groups such as the indigent, children, teenagers, senior citizens and the handicapped. Students enroll in the course one quarter before graduation when they have attained extensive clinical experience and a professional orientation. They know that a clear understanding of community dental health is necessary for graduation, for state board certification and for long-range career goals.

The subject matter and course plan of Community Dental Health are ideal for an effective, reality-oriented writing course (this is true for many job-related courses in community college programs). Students are required to research a plan, conduct a survey and recommend a program to solve a dental problem in the local community. This requires the practical application of the forms and strategies of technical writing. Because students work with the public, government agencies, private organizations, and various dental professionals, they test their communication skills "under fire" in the real world. If they do not communicate clearly and forcefully when composing requests, constructing questionnaires or formulating proposals, they suffer realistic consequences and have difficulty completing their projects on schedule.

The following course schedule reveals how integrated strategies worked in the writing classroom. In Technical Report Writing, the schedule was pragmatic. It was designed to facilitate the specific tasks students needed to accomplish, as these tasks arose. Three formal papers were required during the quarter: a literature review, a proposal memorandum and a final report. In addition, twelve smaller assignments, mostly completed in class, contributed to the final report. Topics covered included conventional technical writing subjects: communication models, principles of good writing, forms, visuals, business letters, informal and formal reports. The course was taught using a combination of lecture, discussion and writing workshop techniques.

## TECHNICAL REPORT WRITING

### Schedule of Assignments for Interdisciplinary Course
### Dental Hygiene Section

Unit I  Introduction

Brief memos for varying audiences; assignment develops background material on communication models and procedures for rhetorical analysis.

Unit II  Library Research

Literature review of a contemporary, community dental health problem.

Unit III  Process Descriptions and Instructions

Step-by-step procedures and instructions for carrying out dental activities.

Unit IV  Proposal Memorandum

Proposal to conduct epidemiological survey or study to measure the extent of a dental problem in the local community and to quantify data.

Unit V Business Correspondence

Letters needed for survey or study; letters of transmittal for final report.

Unit VI Questionnaires

Questionnaires focusing upon dental issue under study.

Unit VII Visuals

Charts, tables, graphs and illustrations needed to convey data discovered in survey or study.

Unit VIII Clear Communication Principles

Workshop activities designed to improve the efficiency and effectiveness of prose; topics include the use of active verbs, simple sentences, readability formulas, etc.

Unit IX Abstracts

Descriptive and informative abstracts of final report and selected dental articles.

Unit X Resumes

Resumes focusing upon expertise as dental professionals.

Unit XI Final Report

Program plan and evaluation to solve a contemporary dental health problem in the local community; report culminates and incorporates work of the entire quarter.

Some of the dental health problems students examined during the quarter included: the effect of children's TV advertising on the carbohydrate consumption of low-income children; the need for a hypertension continuing education program for dental professionals; nutritional programs at senior centers; the efficiency of a larger handled toothbrush on plaque removal; a study of gingival inflammation and periodontal disease among institutionalized teenagers. The Dental Hygiene Department instructed students on the biostatistical techniques needed to quantify data and prepared students to deal with base-line data, means, medians, standard deviations and the like. I helped them to communicate what they proposed to do in clear English.

## So What: The Results of Our Interdisciplinary Technical Writing Course

The assignments of Technical Report Writing and Community Dental Health culminated in a comprehensive final report. It was submitted to English and dental hygiene faculty for evaluation. The final report was expected to be clear, well-organized and effectively written as would be the case in any technical writing course. In addition, because of the interdisciplinary approach, the report's contents were expected to be valid, verifiable and replicable as would be expected of a report composed in the scientific community.

We believe that the interdisciplinary approach helped our students transcend artificial barriers created by curricular design. They learned writing strategies in the context of their professional development (reference 6). Enrolling in the course after they had acquired substantial technical expertise, practical experience and adequate verbal skills, these students used Technical Report Writing for career preparation. They produced technically sophisticated assignments. It is well to remember that in many two-year colleges and vocational programs, the student's concentration in technical courses does not differ significantly from a major's concentration in technical courses at a four-year college. In the case of Dental Hygiene students, for example, some four-year programs differ from our two-year program only in that they offer additional courses in the arts and sciences (reference 7).

As we implemented the collaborative approach, we found that our instructional roles shifted from lecturers or dispensers of knowledge to learning facilitators who encouraged our students to make their own discoveries. Students used us as technicaland writing consultants who were available to aid them in the complex project of designing a community dental program. We are convinced that by integrating our course material, we helped our students produce reports far superior to anything they could have done on their own or with one of us in isolation. We believe that the interdisciplinary approach contributed to student interest, motivation, achievement and numerous students expressed satisfaction about learning writing in a context they deemed significant.

The success of the pilot project has encouraged us to expand our program. We plan to develop interdisciplinary courses for several other technologies offered at the college. We believe that interdisciplinary technical writing courses are an excellent way to teach job-related communication skills to today's college students.

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# DESIGNING MINORS IN TECHNICAL COMMUNICATION FOR TECHNICAL STUDENTS

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This paper describes the process our department has gone through to establish a minor in technical communication for technical students at our university. At the same time, I want to touch on certain problems that this process has brought to light.

Our department offers a major in technical communication, and we now have about sixty majors. But the vast majority of the students the department serves are technical people in animal science, fisheries, horticulture, food science, nutrition, forest resources, and some engineers. When the subject of establishing a minor in technical communication first emerged about two years ago, the head of our department formed a committee to look into the possibilities and the problems. As is true of most committees, ours began by fantasizing about all the good that would flow from establishing a minor. Foremost, of course, was the prospect of an increased headcount for the department. We envisioned 50 to 100 students signing up for a minor in technical communication during the first year. We imagined that this surge in numbers in our courses would reenforce our position in the college and in the university. In a period of shrinking financial support, our growth as a department would be a powerful signal to the central administration that we are clear thinkers and bold planners, true exponents of supply-side academics.

As our committee sobered, however, we began to anticipate some of the problems that the introduction of a minor might bring. Even if half the number of students we envisioned elected a minor in technical communication, this increase might put a severe strain on some of our upper division courses, and it seemed unlikely that money for new teaching positions would be made available to us. There was never any doubt in our minds, however, that a minor in technical communication would serve a need. We had all heard and read the words of the people who hire our technical graduates: The people we hire are technically competent, but they can't write or speak effectively. In sum, they can't communicate.

As our committee circled the problem we finally got to the point where we should have begun. We realized we had not asked some basic questions:

1. Do our students want a minor in technical communication to be made available to them?

2. If so, what kind of minor do they want?

3. Would they elect such a minor if it were available?

4. Do the teachers and advisors in the technical department we serve want a minor in technical communication to be available to their students?

5. If so, what kind of minor?

6. If a minor were available, would they advise their students to elect it?

The Survey

When we realized we had failed to consult our constituents on the matter, we decided to survey them to get their opinions. But survey them about what? So far we had nothing for them to consider. To solve this problem we asked the members of our department to design and to submit to the committee some proposed minors in technical communication. From these submissions we sorted out two basic designs which were very similar. One design we labeled Minor in Technical Communication. The other we labeled Minor in Technical Writing. A third design was submitted by people interested in efficient reading, effective listening, and interpersonal communication. They called their design a Minor in Receptive Communication.

These were the three designs we included in the surveys we put together for our technical students and the technical faculty. We wrote a brief rationale for each design and added three response items. We asked each student to rank the options in terms of their potential value to majors in the student's technical field. We asked them to answer these questions:

1. If you were to elect one of these minors, which one would you elect?

2. If given the opportunity to elect one of these minors, will you do it?

We asked the technical faculty to rank each option in terms of its potential value to undergraduate majors in the technical departments, and to answer these questions:

1. If you were to adivse one of your students to elect one of these minors, which one would you recommend?

2. If given the opportunity to recommend one of these minors, will you do it?

The student survey was completed by 100 upper-division students in the colleges of Forestry, Agriculture and Home Economics who were at the time enrolled in our courses in professional and technical writing. The faculty surveys were sent to all departments of the College of Agriculture. We received replies from 35 faculty representing 10 departments. These replies were important to us because, on the average, the 35 faculty who replied advise 21 undergraduate students apiece. Without getting bogged down in the statistics, here are some numbers we found significant: 92% of the faculty who responded said that given the opportunity they would recommend to their advisees that they enroll in one of these minors. Of the 100 students who responded, 48% indicated that given the opportunity they would elect one of these minors. Several faculty, of course, added the caveat that any recommendations they made would depend upon the career interests and goals of the individual students, and several students pointed out that because they were already juniors and seniors it was too late to consider one of these minors. But our committee was primarily interested in determining interest and attitudes rather than potential headcount. Faulty as the study was in many ways, it gave us enough information to recognize that a minor in technical communication, whatever its final form, would receive strong support from both students and faculty--more support, perhaps, than our department was prepared to handle.

Program Design

Our major in technical communication combines prescription and free choice and, we believe, provides a balance of the practical and the theoretical. The internship requirement provides for practical experiences in the so-called real world. We believe the program puts a balanced emphasis on the communication arts--the written, the spoken, and the visual. As we tried to formulate a design for a minor in technical communication, however, we were forced to consider some obvious but basic questions. We think we know what a major in technical communication is, but what is a minor? Is it an incomplete major? Is it a shorter but more focused major? Should a minor be conceived of as a mosaic, a pattern of individual courses pieced together to serve the technical career goals of individual students? Or would a selected core of required courses provide communication skills that will transfer across the technical professions? Would it be better to offer one minor or two distinctly different minors? We have not answered any of these questions with finality. Our committee finished its deliberations and submitted a proposed Minor in Technical Communication to the college assembly for approval. The new program will go into effect in September, 1981. This is that minor:

Required Basic Communication

Freshman Communication I and II
Public Speaking
Professional Writing or Scientific and Technical Writing

In addition to these basic communication requirements, the minor in technical communication shall consist of 30-32 quarter credits, divided as follows:

Required Courses: (20 credits)

Principles of Human Communication

Scientific and Technical Graphics
Scientific and Technical Presentations
Interviewing
Publications Editing

Optional Courses - Group A The student will choose 2 courses from the courses listed below:

Efficient Reading
Interpersonal Communication
Effective Listening
Technical Film
Advanced Public Speaking
Discussion Methods
Professional Writing or Scientific and Technical Writing
Managerial Communication
Writing Modules (2 credits each)
Writing for Publication

Optional Courses - Group B The student will choose 1 course from the courses listed below:

Humanities: Modern Thought and the Enlightenment
Humanities: The Industrial Revolution
Humanities: The Age of Darwin

We decided to include a 20 credit core of required courses because our experience has been that our students generally are more comfortable with a measure of prescription. The options in Group A provide the students with some choices to make that will reflect their individual interests. The Group B options reflect our belief that students who major in technical areas should have some historical knowledge of the impact of science and technology upon the world in which they live.

As I said at the beginning of this discussion, the process we went through to define and to establish a minor in technical communication has exposed problems we have not here-to-fore had to confront. But that process has given some insight into how to stay in touch with those problems as our continuous assessment of our minor proceeds. Our goal, after all, is to serve the needs and interests of the students without compromising our own.

TECHNICAL WRITING PRACTICALLY UNIFIED THROUGH INDUSTRY

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## INTRODUCTION

In order to understand how our technical writing program is set up, I feel you need to have some general background concerning the Agricultural Technical Institute (ATI) which is located in Wooster, Ohio. The Institute is a two-year agricultural college, an administrative unit of The Ohio State University College of Agriculture. ATI opened in 1972 with a beginning class of 198 and is now in its ninth year with an enrollment of about 760. We offer an associate of applied science degree in seventeen technologies, ranging from a traditional dairy science program to a less traditional beekeeping program.

Our student body is diverse, with students from large urban areas and small rural areas; most are from Ohio, though some are from other states and even other countries. Most of the student body is 18-20 years of age and unmarried; of the 766 students, 509 are male and 257 are female. About 33% of the incoming class is placed in a developmental communication skills program and about 50% is placed in a developmental math program. Less than ten percent of our students transfer to bacculaureate-granting institutions.

ATI has four academic divisions under which the seventeen technologies fall, and one academic division, General Studies, under which support courses fall. Below is the breakdown:

Animal Industries Technologies

Dairy
Horse
Livestock--Beef and Swine/Sheep

Horticulture Industries Technologies

Floriculture
Greenhouse
Landscape
Nursery
Turf

Agricultural Mechanics Technologies

Soil and Water
Forest Products
Materials Handling

Agricultural Businesses Technologies

Agricultural Research
Agronomic Business
Beekeeping
Crop Production
Food Marketing

General Studies

Chemistry
Biology/Botany
Math
Social Sciences
Communication Skills
Developmental Education

Technical Writing courses are taught in the Communication Skills area, an arm of the General Studies Division. How we unified these technical writing courses with industry is the topic of today's presentation.

The objectives of the Institute, as set forth in our bulletin, include that of offering a college-level program in selected agricultural technologies so that our graduates possess occupational competence in their technologies. This goal of occupational competence posed a challenge to those of us teaching technical writing. Traditional courses of instruction in technical writing have not been directed to agriculturally based two year colleges. If we were to help fulfill the objectives of the Institute, we had to offer a technical writing program demonstrably based upon the writing tasks of the students' occupations.

Our original technical writing course had already been in existence since the school opened, but it became clear that it was not fulfilling the individual needs of the students in the technologies or the needs of the students in the industries once they graduated. Each technology at ATI has an advisory committee composed of eight to fifteen people in actual industry positions including farm operations. The members, according to ATI requirements, are persons who are recognized by their industry as prominent and successful with a thorough understanding of their total industry needs, challenges and trends. An important point of the committee's formation is utilization of the advice and counsel of such a committee once its members have been brought together. The advisory committees meet separately at least annually to review their programs and make recommendations to the technology coordinators in order to strengthen the program they represent. Courses are added, revised and deleted quite often as a result of industry input. I felt the best place to start in our attempt to unite with industry was to go directly to industry. I got in touch with each member of each advisory committee. Letters went out requesting examples of actual writing they required of their employees, if they were managers, or were required of themselves, whether managers or employees. Many of our advisory committee members run farm operations as well as private businesses, some work in government Extension Offices, or in Soil Conservation District Offices, still others do research or run beekeeping operations, while yet others work in fertilizer or grain and feed operations. Our letters, therefore, went out to over 200 people in all major industry areas of agriculture requesting their comments on what they saw as the need for our English courses to incorporate.

I read and scrutinized all the responses and the actual examples they sent. The result was the revision of one technical writing course and the creation of a second writing course. Students in most technologies have a choice; they may take T113 (Appendix A), our original, revised course, or T114 (Appendix B), our new technical writing course.

I would like to present the two courses today so you can further see how we unified industries' ideas with our technical writing courses. I'd like to begin by describing Technical Writing T113 (Appendix A).

## TECHNICAL WRITING

Business letters seemed to be the one constant in every advisory committee members' response, in fact, writing letters seemed to be the major type of writing needed in every area represented. The student, however, must write letters specific to his/her technology, so that a student in the crops curriculum must deal with letters of sales, complaint, inquiry, and so on, as they pertain to crop production. The students are asked to go to their technology coordinator for actual situations if they need suggestions. The time spent on letter writing is comparatively short in this course for although all industries indicated the need for business communications, some stressed other areas as well. The students who will now take this course are in curriculums where advisory people indicated need for some research and many types of reports. The syllabus indicates seven types of reports--the process report, the proposal, the progress report, the research paper, the technical definition, the summary, and the abstract. All these areas are covered in all sections of T113 but all students are not required to do all reports. A student in the Research curriculum, for instance, might be required to write a research paper and a progress report, for those are two types of reports commonly needed in that industry. Students in the animal curriculums might be required to write a process report, a progress report and/or a proposal as those three are needed in their fields. For example, a process report would be used for explaining how an animal is to be vaccinated or how artifical insemination is to be done, a progress report would be used to keep records on a particular animal or project on the farm, and a proposal might well be used to apply for a loan from a bank if an individual is expanding his or her farm operation. The major difficulty involved in this "unification" with industry occurs when our technical writing sections are multi-curriculum classes. This is indeed a more difficult but not impossible task for the instructor. The instructor must deal with students on an individual and small group basis. Appendix C indicates a syllabus used in one of my T113 Technical Writing courses.

## BUSINESS COMMUNICATIONS

Our second course, T114 Business Communications (Appendix B), is a direct off-shoot of the advisory committee study. The needs of many of our students would still not be met with our initial course, even as revised. Business communication, an occupational communications course, is set up as a less traditional technical writing course. There is a much greater emphasis on letter writing in this course. Students in the Soil and Water program, for example, if employed by a Soil and Water Conservation District will spend a good deal of time corresponding. The section includes, as you can see, a far more detailed list of types of correspondence-informal as well as formal.

Several advisory committees indicated the need for filling out forms, as evidenced by the material received from the Ohio Grain, Feed and Fertilizer Association, Inc., to name just one. Forms suggested included order blanks and work schedules. Again, as the quarter begins, an instructor has to see what curriculums are represented and then organize for individualized instruction, working with the technical coordinators and collecting materials from industry. The section dealing with meetings arose from the call by some advisory committee members for the need to organize and take part in such organizations as Farm Bureau. Included in this area might be written announcements for meetings.

Still other responses, those from the horse curriculum, floriculture, turf and wood products just to name a few, called for brochure and newsletter publications as well as media ads and news articles. (A syllabus for T114, Winter 1981, is presented in Appendix D).

Most responses stressed the need for communications in general. One gentleman, a farmer, called to express his hope that writing, that speaking, that dealing with employers and employees be a major part of the English program. He was calling, he said, because he had few communciation skills, didn't feel qualified enough to write me a letter and had, indeed, been hampered by the lack of such skills. Such testimony, I might add, is invaluable in motivating students.

The final topic covered in the course is the report. Many advisory committees mentioned the need for progress reports and proposals, though not major research papers, process reports or summaries and abstracts. Horse students, turf students, soil and water curriculum students, to name a few, according to advisory committee responses, indicated the need for progress reports for animal progress or project progress; proposals were indicated as well for drainage construction on golf courses and farm land or for enlarging existing facilities. One report of this nature, then, is incorporated in this course. The two types are discussed and the students, depending on their technology, chose one. Therefore, in a class of 25, there may be two types of reports being written at the same time.

CONCLUSION

William F. Funderbunk, in a paper delivered at the Conference on Technical Writing, 1978 at Southern Illinois University, in Carbondale, said, "Educators can better prepare their students for jobs in industry if they actually seek the advice and counsel of people from industry. Working together, they can study the needs of industry and plan courses and programs that help to meet these needs."

Our two courses are not perfectly divided. Some students who will take T113 will miss out on some material they might need that is covered in T114, and visa versa. But certainly since I undertook the study, I feel ATI has moved forward, as Mr. Funderbunk suggested. With the revision of our original course and the introduction of a new one, we at ATI are better meeting the needs of our students for their future employment in their industries.

APPENDIX A
COURSE DESCRIPTION
COMMUNICATIONS SKILLS T113

I. COURSE ORGANIZATION
   A. Title: Technical Reporting
   B. Credit: 3 hours
   C. Periods Per Week: 3 cl
   D. Prerequisites: Old T101, New T101 and T102 or T111
      Not open to students with T103 credit

II. COURSE DESCRIPTION

Training and practical writing for industry, business, and research with emphasis on special requirements and techniques for the technical report.

III. COURSE OBJECTIVES

The student should be able to:

1. demonstrate in writing a working knowledge of the English language;
2. demonstrate the ability to write tactful, effective business letters in conventional formats;
3. graphically represent the information contained in technical reports and papers;
4. demonstrate a knowledge of how to find information in the library, how to pre-write reports, how to evaluate information, and how to present information in conventional report formats.

IV. COURSE CONTENT

- A. Reporting Information
  1. Importance of communication
  2. Definition and role of technical writing
  3. Audience analysis
- B. Effective Business Communication
  1. Types of Business Communication
     a. Letters
     b. Reports
  2. Business Letters
     a. Inquiry
     b. Claim, Adjustment
     c. Sales
     d. Order
- C. Gathering Information
  1. Sources
     a. Library
     b. Meetings, interviews, etc.
  2. Notetaking
  3. Evaluating and organizing information
     a. Logical analysis
     b. Outlining

D. Presenting Technical Information
   1. Types of reports
      a. Process report
      b. Proposal report
      c. Progress report
      d. Research paper
      e. Definitions/Summaries/Abstracts
   2. Techniques of Exposition
      a. Mechanical elements
      b. Stylistic elements
   3. Illustrating Technical Reports
      a. Usefulness of visual aids
      b. Occasion for use
      c. Types of visual aids
         1. Charts
         2. Diagrams
         3. Tables

V. SUGGESTED TEXT

Pickett, Nell Ann and Ann Laster, Technical English, 3rd Ed., San Francisco: Harper & Row, 1980.

VI. REFERENCES

Andrews, Deborah C. and Margaret D. Blickle, Technical Writing: Principles & Forms, New York: Macmillan Publishing Co. Inc., 1978.

Dagher, Joseph P., Technical Communication: A Practical Guide, Englewood Cliffs, N.J.: Prentice Hall, Inc., 1978.

Eisenberg, Anne, Reading Technical Books, Englewood Cliffs, N.J.: Prentice Hall, Inc., 1978.

Houp, Kenneth W. and Thomas E. Pearsall, Reporting Technical Information, 3rd Ed., California: Glencoe Press, 1977.

Leonard, Donald J., Shurter's Communication in Business, 4th Ed., New York: McGraw Hill, 1979.

VII. EVALUATION PROCEDURES

Writing Assignments including letters and formal and informal reports = 80%
Exams = 20%

APPENDIX B
COMMUNICATION SKILLS TECHNOLOGY T114
COURSE DESCRIPTION

I. COURSE ORGANIZATION
   A. Title: Business Communication
   B. Credits: 3 hours
   C. Distribution of class time: 3 cl
   D. Prerequisite: T111 or T101 and T102

II. COURSE DESCRIPTION
Training and practical skills for business writing with an emphasis on specific requirements and techniques for all occupational communications.

III. COURSE OBJECTIVES
The student should be able to:
1. demonstrate in writing and speaking a working knowledge of the English language;
2. demonstrate an ability to research, evaluate, organize and present material for various types of written and oral communications (aside from letters) needed in an occupational setting;
3. effectively write various types of personal and business letters using English and conventional formats;
4. prepare visual materials found in occupational communications.

IV. COURSE CONTENT
   A. Importance of Occupational Communications
   B. Effective Occupational Communications for Public Relations
      1. Usage
      2. Appearance
      3. Accuracy
      4. Efficiency
      5. Clarity
      6. Tone
   C. Business Letter Writing
      1. Formats
         a. Parts of a letter
         b. Layouts
         c. Envelopes
      2. Types of Business Letters
         a. Inquiries/Requests
         b. Informational
            (1) explanations
            (2) instructions
         c. Sales letters
         d. Credit letters
         e. Collection letters
         f. Goodwill letters
         g. Personal letters
         h. Form letters
         i. Order letters
         j. Remittance letters

3. Informal messages
    a. Memos
    b. Forms
    c. Applications

D. Interpersonal Occupational Communications
   1. Meetings
      a. Organizing/calling
      b. Minutes
   2. Newsletters
   3. Brochures
   4. Media ads - news articles
   5. Telephone Use
   6. Evaluative Reports
      a. Employee
      b. Employer
   7. Interviews
   8. Communication among workers
      a. Upward (supervisors)
      b. Downward (subordinates)
      c. Horizontal

E. Visuals for Occupational Communications

F. Informational Reports
   1. Progress Report
   2. Proposal

V. RECOMMENDED TEXT

Akrey, Isabell and Bernadette V. Metzler, Principles and Techniques of Effective Business Communication: A Text-Workbook, New York: Harcourt Brace Jovanovich, 1976.

VI. REFERENCES

American Association of Agricultural College Editors, Communications Handbook, 3rd Edition, Danville, IL: Interstate Printers and Publishers, Inc., 1976.

Dawe, Jess Amon and William Jackson Lord, Jr., Functional Business Communication, Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1974.

Eggland, Steven and John W. Williams, Human Relations in Business, Cincinnati: South-Western Publishing Co., 1977.

Leonard, Donald J., Shurter's Communication in Business, New York: McGraw-Hill, 1979.

LeVel, Dale A., Jr., and William P. Galle, Jr., Business Communications: Theory & Practice, Dallas: Business Publications, Inc., 1980.

Michullia, Jean H., Let's Talk Business, Cincinnati: South-Western Publishing Company, 1978.

Robertson, Mary, and W. E. Perkins, Practical Correspondences for Colleges, 4th Ed., Cincinnati: South-Western Publishing Co., 1974.

Wiener, Solomon, Mastering Business Letter Writing, New York: Simon and Schuster, 1978.

Williams, John W., and Steve A. Eggland, Communicating At Work, Cincinnati: South-Western Publishing Co.

Wolf, Morris Philip, Dale F. Keyser and Robert R. Aurner, Effective Communication in Business, 7th Ed., Cincinnati: South-Western Publishing Co., 1979.

VII. EVALUATION

Written Assignments and Classwork = 70%
Exams = 30%

APPENDIX C
COMMUNICATION SKILLS T113
SYLLABUS

Summer, 1980
Linda Houston
Home Phone: 264-9918
Office: 144B
Office Hours: MWF, 9-10, 12-1
Class Meeting: MWF, 11 a.m., Room 212

Course Description:

This course is designed to help you achieve more confidence in extracting, evaluating, and synthesizing information; you will need to have a working knowledge of materials in the library (ATI, OARDC, OSU interlibrary loan facilities, Wayne County Public Library, the College of Wooster, etc.). The course is a course in the processes of writing specific types of papers, many of which you may be called upon to complete for other courses at ATI as well as in the years to come; the emphasis will be upon clear, concise, accurate, conventional, appropriate materials on a worthwhile subject of interest OR technical field as specified in the assignment. Technical writing is written communication using specific vocabulary (language) for a specific audience on a particular occasion.

Course Objectives:

To successfully complete the course a student should be able to do the following: 1) show through his/her work an acceptable knowledge of the English language; 2) demonstrate the ability to write specific types of letters using conventional style and form; 3) demonstrate an ability to prepare, research, and write technical reports in a logical, well-thought-out manner; and 4) show the ability to use and interpret graphic elements in technical reports.

Texts: Technical English, 3rd Edition, Pickett & Laster, 1980.
Dictionary (paperback will do)

Materials: Folder(s) for papers
$8\frac{1}{2}$ x 11" non-spiralled paper

Notes:

1. You are expected to prepare and present your own materials and to acknowledge your indebtedness to others. Plagiarists (cheaters) face an E grade in the course, possible dismissal from the University, and/or a note on the permanent record.
2. As a general rule, exams may not be made up. Arrange to complete work before absence. In any event, see the instructor before the next class period.
3. You do not need to type your papers. However, legibility and neatness are essential for a passing grade. Please use pen for all major assignments.

4. Attendance is expected. Field trips are excusable, but <u>you</u> are responsible for all work covered in and out of class. A paper will receive a 5 point penalty for each day late; it may not be turned in later than 5 days after its due date.
5. Exams will be based on textbook readings and lecture notes; lectures may cover extra material than what is found in the text; text material will not always be covered in the lecture; thus, you are required to read the textbook.
6. A report may be written simultaneously for this course and for another course, but previously done work is not acceptable.
7. This course (T113, Summer, 1980) has been set up in conjunction with Dr. Borton's Animal Tech 225, Livestock Disease Prevention. If you are not taking that course, another report may be substituted for the research paper.
8. All papers will be collected on the last day of the quarter.
9. This course is set up for lectures and work sessions. There will be many work days for individualized help. I will announce those ahead of time. The important point is to keep the lines of communication open. Ask questions, come to my office, see me in class--but don't assume--check it out!

Grading Scale:

| | |
|---|---|
| 90-100 = A | 74-76 = C |
| 87- 89 = B+ | 70-73 = C- |
| 84- 86 = B | 67-69 = D+ |
| 80- 83 = B- | 60-66 = D |
| 77- 79 = C+ | 59-below = E |

Tentative Grade Weights:

| | | | |
|---|---|---|---|
| | Letters | 20% | (200 points) |
| | Definition | 10% | (100 points) |
| | Summary | 10% | (100 points) |
| Choose One | Process/Device<br>Progress<br>Proposal | 20% | (200 points) |
| | Research/Disease | 10% | (100 points) |
| | Exams | 30% | (300 points) |
| | Total | 100% | (1000 points) |

Tentative Schedule:

| Week | Text | Subject | Assignment |
|---|---|---|---|
| June 23, 25,27 | Part III Ch. 9 | Introduction to Technical Writing<br>Principles of essay writing<br>Obstacles to good technical writing<br>Factual vs. personal writing<br>Library Orientation | Text - Ch. 9<br>Research disease paper |
| June 30 July 2,4 | Ch. 9 | Research paper techniques | Work on research paper, Due July 11<br>Plan Sheet #1 (p. 387)<br>Plan Sheet #2 (p. 389)<br>Plan Sheet #3 (p. 391)<br>Plan Sheet #4 (p. 393) |

| Week | Text | Subject | Assignment |
|---|---|---|---|
| July 7, 9,11 | Ch. 7<br>Ch. 8 | Business Letters<br>Proposals & Progress Reports | Letters - Due July 25<br>Health plan outline<br>Due August 1 |
| July 21, 23,25 | Ch. 3 | Definition<br>Catch-up<br>Return Exam | Written definition in class - Due July 23<br>Letters Due July 25 |
| July 28, 30 | Ch. 11 | Visuals | Outline - Health Plan |
| Aug. 1 | Ch. 8<br>Ch. 6 | Reports<br>Summaries | Due August 1 |
| Aug. 4 6,8 | Ch. 1<br>Ch. 2 | Process/device papers | Summary in class, Aug. 4<br>Work on Health Plan |
| Aug. 11, 13,15 | Ch. 1<br>Ch. 2 | Visuals | Work on Health Plan paper<br>Due August 25<br>Prepare visual for process/device report |
| Aug. 18, 20,22 | | | EXAM II<br>Work on Health Plan |
| Aug. 25 | | | Final Paper Due |

APPENDIX D

T114 Business Communication Syllabus
Winter, 1981
Linda Houston
Home Phone: 264-9918
Office: 144B
Office Hours: M-W-F By appointment; T-R 9-12, 1-2:30
Class Meeting: M-W-F 12, room 075

Course Description:

This course is designed for training in practical skills for business writing with emphasis on specific requirements and techniques for all occupational communications including letters and memos, business meetings, advertising, employee-employer evaluative reports and informational reports.

Course Objectives:

The student should be able to:

1. demonstrate in writing and speaking a working knowledge of the English language;
2. demonstrate an ability to research, evaluate, organize and present material for various types of written and oral communications needed in an occupational setting;
3. effectively write various types of personal and business letters usir standard English and conventional format;
4. prepare visual materials found in occupational communications.

Text: Principles and Techniques of Effective Business Communication, Krey and Retzler Paperback Dictionary

Materials: Folder(s) for papers; Theme paper

Notes:

1. You are expected to prepare and present your own materials and to acknowledge your indebtedness to others. Plagiarists (cheaters) face an E grade in the course, possible dismissal from the University, and/or a note on the permanent record.

2. As a general rule, exams may not be made up. Arrange to complete work before absence. In any event, see the instructor before the next class period.

3. You do not need to type your papers. However, legibility and neatness are essential for a passing grade. Please use pen for all major assignments.

4. Attendance is expected. Field trips are excusable, but you are responsible for all work covered in and out of class. A paper will receive a 5 point penalty for each day late; it may not be turned in later than 5 days after its due date. If you know ahead of time an assignment will be late, see the instructor before the due date.

5. Exams will be based on textbook readings and lecture notes; lectures may cover extra material than what is found in the text; text material will not always be covered in the lecture; thus, you are required to read the textbook.

6. A report may be written simultaneously for this course and for another course, but previously done work is not acceptable.

7. All papers will be collected on the last day of the quarter.

8. This course is set up for lectures and work sessions. There will be many work days for individualized help. I will announce those ahead of time. The important point is to keep the lines of communication open. Ask questions, come to my office, see me in class--but don't assume--check it out!!

Grading Scale:

| | | | |
|---|---|---|---|
| 90-100 | A | 74-76 | C |
| 87- 89 | B+ | 70-73 | C- |
| 84- 86 | B | 67-69 | D+ |
| 80- 83 | B- | 60-66 | D |
| 77- 79 | C+ | 59-below = E | |

Tentative Grade Weights:

| | |
|---|---|
| Letters | 20% |
| Newsletter/Brochure/Ad | 10% |
| Employee/Employer Assignment | 10% |
| Report/Proposal | 15% |
| Oral Assignments, Classwork | 15% |
| Exams (Including final) | 30% |

Tentative Schedule:

| | | |
|---|---|---|
| Jan. 5 | Introduction to Course<br>Purposes of Business Writing<br>Appearance<br>Clarity/Tone<br>Language | Ch. 1, 2, 3, 4 |
| Jan. 12 | Letters | Ch. 5, 6, 7, 10, 11, 12, 13 |
| Jan. 19 | Letters | Same as above |
| Jan. 26 | Letters<br>Memos (Due Feb. 4)<br>EXAM I - January 30 | Ch. 9 |
| Feb. 2 | Introduction of Proposal/<br>Progress Reports (Due Mar. 6)<br>Visuals | Ch. 14 |

| | | |
|---|---|---|
| Feb. | 9 | Meetings<br>Telephone Communication<br>Interviews |
| Feb. | 16 | Newsletters/Brochures/Ads (Due Feb. 27) |
| Feb. | 23 | Newsletters<br>Brochures<br>Ads |
| Mar. | 2 | Work on Proposal/Progress<br>Employer/Employee<br>Communication - evaluative reports<br>(upward, downward, horizontal) |
| Mar. | 9 | Employer/Employee Communications<br>(Due Mar. 11)<br>EXAM II - Mar. 9 |

Panel F-9

The Composing Process in Technical Communication

# THE COMPOSING PROCESS IN TECHNICAL COMMUNICATION

Roger E. Masse
Department of English
College of Arts and Sciences
New Mexico State University
Las Cruces, New Mexico 88003

Welcome to this session on the composing process in technical communication. I am Roger Masse. I teach technical writing at New Mexico State University. In my classes, I have been beginning the semester's work with discussions of students' composing processes and with methods to improve those processes.

Because of my success with the composing processes in these beginning classes, I read with particular interest the papers that the panel members have prepared for the session. The papers provide valuable information on the theory and application of the composing process in technical communication. They provide me with ideas and techniques that I can use in my teaching and research. I think they will do the same for you. The panel members will provide you with a theoretical view of the composing process in technical communication, a report on a study of the composing process of engineers, some implications of composing research for the teaching and research of technical communication, and an interpretation of the processes in technical communication as creative experience.

Begin with the theory of the composing process in technical communication. This theoretical view will be explained by Jean Lutz of Rensselaer Polytechnic Institute. Jean has studied at Old Dominion and RPI and has taught at RPI. Jean has done quite a bit of work in rhetoric and technical communication and uses that background to build a theory of the composing process in technical communication.

## ABSTRACT FOR JEAN LUTZ'S "A THEORETICAL VIEW OF THE COMPOSING PROCESS IN TECHNICAL COMMUNICATION"

Jean Lutz of Rensselaer Polytechnic Institute provides a theorectical basis for understanding the composing process in technical communication. As she theorizes about the technical communicator's role in composing, Lutz applies a problem-solving, process-based writing model to three rhetorical features of technical communication. First, Lutz reviews the relationships between rhetoric and technical communication in terms of both beginning with a proposition, both relying on form, and both fitting text to audience. Then, to explain how these features are used in a composing process, Lutz adapts the Flower-Hayes writing model of planning, translating, and reviewing to the special features of technical communication. Lutz's model includes contextualization of the rhetorical task or thinking and planning the text to accomplish specific intentions, translation or selecting and arranging facts and words for presentation to specific audiences, and revision or retracing planning and translating as the writer not only edits but also compares created text to constantly discovered goals. (RM)

A THEORETICAL VIEW OF THE COMPOSING PROCESS IN TECHNICAL COMMUNICATION

Jean A. Lutz
Department of Language, Literature and Communication
Rensselaer Polytechnic Institute
Troy, NY

## Introduction

Rhetorical features, such as analyzing audience and purpose before beginning to write, are essential to effective communication. They provide a place for writers to begin and help to close the gap between writers and their readers.[1] I am going to ask you now, however, to consider applying a problem-solving, process-based model of writing to representative features of technical communication. This view provides an added psychological dimension to these traditional rhetorical features and gives me a basis to theorize about the technical communicator's active role in composing technical discourse. In this paper, I will review selected rhetorical features of technical communication; then, by looking at them from the writer's point of view, I will speculate about how writers go beyond these features and, in the process of composing, design more effective communication.

## Rhetorical Features of Technical Communication

In reviewing the important relationship between rhetoric and technical communication, we find that the two were not always thought to have anything in common. S. M. Halloran has explained the bases on which science has, since Aristotle's time, been separated from rhetoric: 1)A metaphor of special *topoi*, or places, relegated science to a special sort of argument before a special sort of audience; and 2)Reality-based science had to be devoid of any merely figurative language. Halloran concludes, however (and he is supported in his argument by historians and other rhetoricians), that science and rhetoric have important areas of overlap. "Science," he says, "necessarily involves rhetoric" inasmuch as it involves the character or *ethos* of the communicator and the spirit he shares with others in his discipline.[2]

Given that we accept technical and scientific communication as rhetorical, such a perspective emphasizes the relationship between author, reader, and text: 1) rhetorical and technical communication both begin with a proposition; 2) both rely on form as an important part of subject matter; and 3) both tailor text to suit audience.

Each speaker of classical rhetoric presumably began the construction of an argument with a proposition. Whether rhetors were engaging in legal, deliberative, or ceremonial speaking, they generally began with a thesis and then gathered evidence to support whatever they were defending, prosecuting, praising, or blaming. They only had to find ways to argue convincingly enough so that an audience would accept their proposition too.

The modern writer of technical and scientific communication is in a similar rhetorical position because a great deal of a technical communicator's process of invention goes on before he or she writes. An experiment has been conducted or a design has has been developed before the scientist or engineer sits down to write. In one sense, then, these writers, like the classical rhetoricians, begin with their propositions in mind.

A second area of overlap between classical rhetoric and technical writing is an emphasis on form as an important part of subject matter. Classical rhetorical theory provided numerous patterns for arranging material and presenting it to an audience. The rhetor had a sort of rhetorical grab-bag out of which he could choose a form that was appropriate for his argument and audience.

Like the classical rhetorician, today's technical communicators have letter formats, formal and informal report designs, and other comparable forms from which they may choose to suit a particular rhetorical situation. They have, in other words, a conventional design for presenting information to a reader.

A final, and obvious, common area between rhetoric and technical communication is an emphasis on the listener and reader. In classical times, rhetoricians devoted a great proportion of their energy to audience analysis: one-third of Aristotle's Rhetoric concerned how to win arguments and influence audiences.

Technical communication shares classical rhetoric's concern for analyzing one's audience and for tailoring the text to suit its needs. Textbooks by Houp and Pearsall, Pearsall and Cunningham, and Mathes and Stevenson, for example, emphasize the importance of communicators' knowing and writing to audience needs. Presenting the precise information that a reader needs with precisely the order and clarity that a reader's cognitive structure expects are some of the reasons which justify this concern. As mentioned earlier, Halloran and others have described the technical communicators' concern with having their discourse appeal to and be accepted by the technical and scientific community. If the engineers and scientists fail to assess their audiences properly and fail to write with an accurate understanding of audience needs in mind, their communications will be much less likely to succeed.

A proposition, a format, and a perspective on audience provide significant momentum for beginning to write, for they offer worthwhile and necessary constraints to writers beginning to formulate ideas. They also describe features that every finished piece of technical communication should have.

Often, however, these features seem to be imposed from the outside; knowing that they do and should exist does not tell us much about the internal problem-solving activities that technical communicators may go through to achieve them in their finished products.

Current composition research, however, offers a theoretical perspective on how these features may be produced, a perspective which I believe may increase our understanding of the technical communicator's own active role in composing.

## Theoretical Background for Process-Based View of Technical Communication

As a theoretical foundation for a process-based view of technical communication, let's turn to the Flower/Hayes Writing Model. (See Figure 1.)[3] This model, which proposes a problem-solving approach to writing, divides the actual writing process into three major sub-processes: planning, translating, and reviewing. The portion of the model which describes planning includes input from long-term memory and from a perception of the writing assignment, two other components of the model which require writers to check their knowledge of topic, audience, and writing plans (the contents of long-term memory), and to interpret and define their specific writing assignment: what the topic, audience, and motivating cues require. Theoretically, these aspects of planning not only stimulate writing, but they are believed to interact with the writing process to influence translating decisions as the writer continues to write. This major process of planning itself includes three other important subprocesses: generating (retrieving information from long-term memory); organizing (structuring what has been generated); and goal setting (a sub-process which stimulates the writing process and may be redefined as writing continues-- writers begin their writing tasks with goals in mind, but these goals are believed

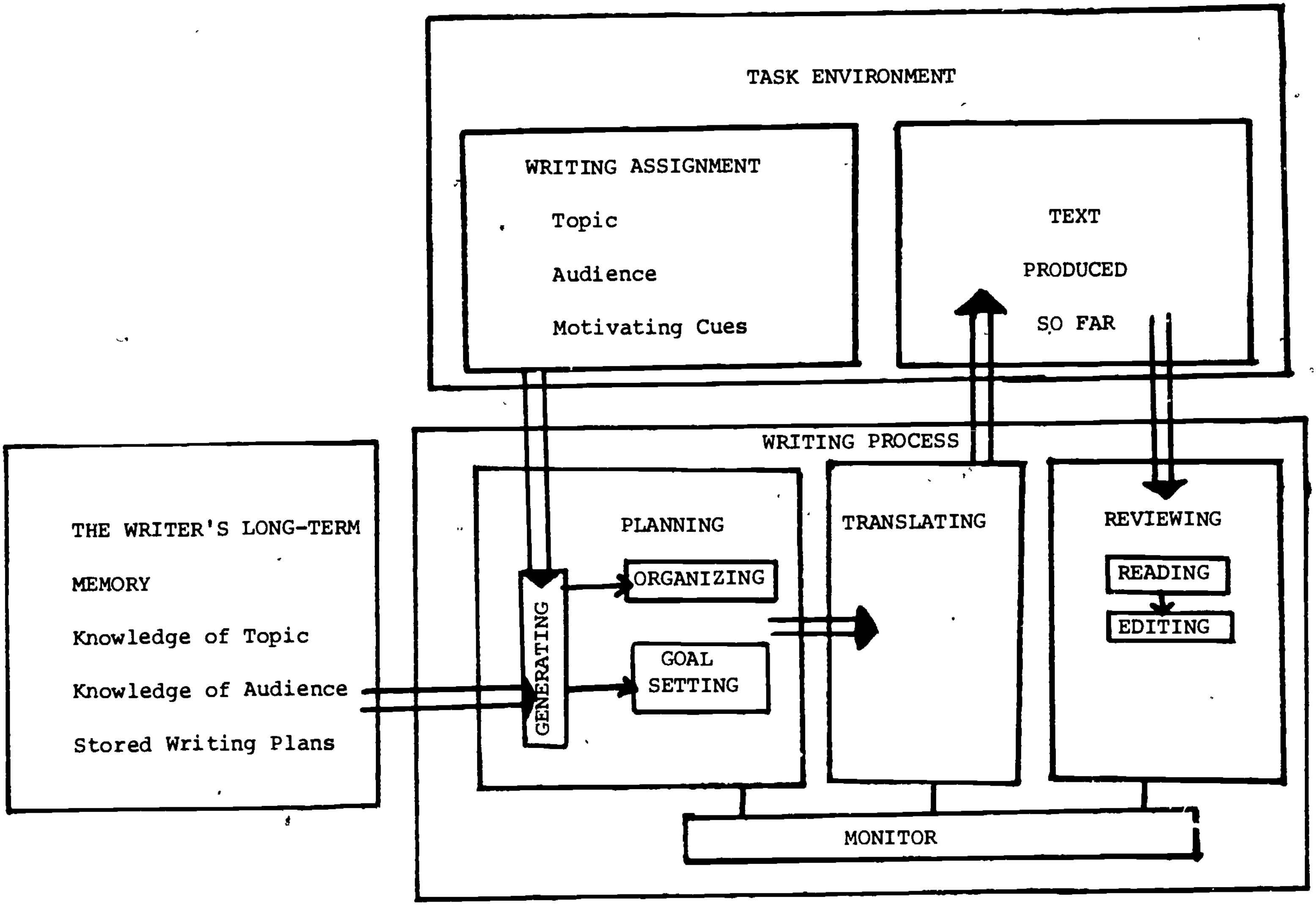


Figure 1. Structure of the Writing Model
From Hayes and Flower, "Uncovering Cognitive Processes in Writing"

to change as writers generate new ideas as part of the writing process and thus form new goals based on new ideas). Of the other two major sub-processes of the writing process, the translating process uses the input from planning to produce another aspect of the model, the text produced so far; and the reviewing process-- including reading and editing--consists of reading and changing the text produced by the translating process. All of these processes take place under the continuing supervision of the internal monitor of the writer, an element which directs the writer's attention among all the processes represented in the model. The interrelationship between the parts of the model is significant: The writer's goals in the writing process are not static. Though the writer may begin with a perception of the writing assignment in mind, this perception may change as the writing continues. Writers may simply redefine the assignment task as they are able to determine more closely than when they began writing what they want their communication to do. Since the writing process is quite complex, it requires not only that the writer review the pertinent data in long-term memory and coordinate this aspect of the model with its other aspects; the process also requires that the writer continually measure all aspects of text, from word to whole text level, against continually evolving goals for writing.

I believe this process-based, problem-solving model of writing can be applied to representative rhetorical features of technical communication. I have labeled, after the elements of the writing model described by Flower and Hayes, the elements I wish to discuss contextualization of the rhetorical task, translation, and revision.

## A Process-Based View of Technical Communication

Contextualization of the Rhetorical Task-- In a special sense, technical communicators begin with their proposition in mind. For instance, if the purpose of their research has been to investigate the feasibility of extracting benzene from a waste stream in a chemical plant, they have an answer to this problem in mind when they begin to write.

But discovery for technical communicators does not necessarily end when they attain the results of their research. The thinking and planning processes of writers continue as they transform what Vygotsky called "a saturated sense" of what the writer intends into syntactically articulated speech representative of meaning and intelligible to others. Specifically, the thinking processes of technical communicators continue as they discover, through writing, how they intend for their results to be acted upon and also as they write a communication designed to achieve these intentions. The problem-solving nature of this discovery process is implied in Designing Technical Reports, by J. C. Mathes and Dwight Stevenson : "When you (as an engineer) write reports, . . . you must think in terms of the concrete needs of specific persons in the organization and of the various effects the report will have in the organization. You must design your report to affect the organizational system in ways that you intend."[5] This kind of analysis goes beyond designating audience and purpose at the outset of writing and merely presenting the results of one's research; it requires continuous goal-directed thinking about the context for these results.

In an essay entitled "A Cognitive Process Theory of Writing," Flower and Hayes note that "Writers frequently reduce large sets of constraints to a radically simplified problem."[6] Technical communicators who believe their job is merely to identify the outcome of research and transfer results from their own heads into someone else's may be oversimplifying their rhetorical problem. Instead, they need to figure out how they want their audience to act on these results, a complicated problem and solution which may only evolve as they write. Since these goals are not likely to be fully formed at the outset of writing, writers may have to coordinate the features of their texts to accomplish their goals as they write.

Translation--A second implication of a process-based model for technical communicators involves translation or the selection and organization of facts and their representation in natural language. While rhetoricians have stressed the idea that rhetoric and science are persuasive and involve a manifestation of an author's character in a text, they have been less specific about how this process may unfold. A problem-solving approach to this issue means that writers select and shape facts for presentation to an audience, not all at once at the beginning of the writing process, but continuously as the process evolves in time.

First, writers, even technical writers, choose facts for their audiences. A scientist reporting the discovery of a new drug to regenerate spinal tissue or a manager reporting an accident on a loading dock cannot and will not usually report all of the facts involved in these incidents. As they evolve high level goals for their communication, they will choose only those facts which substantiate their chosen positions.

The dimension that a process view of composing adds is that the relevancy of facts is not determined by the facts themselves, but by the goals established by authors as they write. Choosing facts becomes a sub-process of goal-setting and organizing because a high level goal for writing enables a writer to search for and choose subordinate information which will reinforce the goal. This means that as a writer's goals evolve and change, the facts selected and their order of presentation may also change.

Complementary to choosing and arranging facts is choosing words to present them. A process view of how the use of natural language affects composing in technical communication is implied by David Hamilton in a 1978 article in College English: "Writing is the way by which the scientist comes to know his work most fully; it is his most thorough way of understanding what he does. I am not arguing that the scientist is without understanding before he writes. Obviously, he already knows a great deal. But by writing, the scientist formulates his knowledge more thoroughly and forms coherence out of pieces."[7]

This quotation emphasizes the evolutionary nature that I suspect exists in the technical writing process. It suggests that while technical writers have, in the form of facts, much of what they want to say in mind before they write, seeing these same ideas in natural language may help them understand more fully what these facts add up to. Because of this fuller understanding, writers may have to revise the language they have chosen for presenting their facts. Hamilton notes, "Writing brings forth nuances, subtleties, and connections as more abbreviated notation cannot."[8]

Revision-- A third and final problem-solving activity that technical writers may go through is reviewing and revising. Textbook directives about this process generally indicate that it is often narrowly thought of as the third stage in a linear process, a mopping-up and correction procedure applied externally after all creative composing has taken place. A process theory of revision, however, stresses the importance of writers' retracing planning and translating to develop what they want to say.[9] Any fresh insight gained as writers view their texts may take them to any part of the writing model. They may remember something stored in long-term memory that they had not recalled before; they may see more clearly what their audience and exigency require; they may be able to specify more clearly what their purpose should be and how they should choose and present their facts. As they develop and set clearer goals, writers will adjust their content accordingly. And, as they gain perceptual distance from their text, shifting to the role of reader, they may see how facts have been presented and how they may be interpreted--or misinterpreted. In short, writers compare what they have created with their constantly shifting goals. They adjust both until they can be reasonably satisfied that they have produced a suitable goal and a suitable product to match that goal. Revising and editing in technical communication, so often thought of as fixing up, should preferably be thought of as a necessary process of refocusing and reformulation to define and satisfy the optimum rhetorical problem in light of a re-perception of the text, the problem, and its effect on a reader.

An added note--a problem-solving perspective on technical communication may make our jobs as teachers and editors more worthwhile. In both roles, we undertake the task of correcting someone else's prose. If, however, we correct only the grammatical and lexical errors without regard for the other factors in the writing model, we have done only a minimal job in helping others to write more effectively. We have confined ourselves to an analysis of the text, which is afterall, only one part of the complex activity of writing. To increase our own effectiveness, and finally the effectiveness of our students, we must demand a clear statement of an author's rhetorical goals. If we, and an author, do not understand the goal for his or her communication, then we cannot adequately evaluate contextulization, or choice of facts, or presentation of facts or the process of revision--we are limited in what we can do to make a communication optimally effective.

I have reviewed shared aspects of rhetoric and technical communication and have suggested that these are vital features of the communication process. They describe what every reader of technical communication expects, and they suggest important guidelines for beginning the writing process. But descriptions and prescriptions are not enough. To understand more about the complexities of constructing technical information, I have applied a process-based model of writing to selected features of technical communication. I believe that such a view helps us better understand the process a communicator goes through in creating technical discourse.

## Notes

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9. Lillian Bridwell, "Revising Strategies in Twelfth Grade Students' Transactional Writing," Research in the Teaching of English, 14 (October 1980), 197-222; Linda Flower and John R. Hayes, "A Cognitive Process Theory of Writing," 1-28; John R. Hayes and Linda Flower, "Uncovering Cognitive Processes in Writing: An Introduction to Protocol Analysis; and Nancy Sommers, "Revision Strategies of Student Writers and Experienced Adult Writers," College Composition and Communication, 31 (December 1980), 16-26.

One way to test the theory explained by Jean Lutz has been developed by Bonny Stalnaker of Renssaelar Polytechnic Institute. Bonnie has studied at Auburn University and RPI and has taught technical communication and rhetoric at both places. Bonny is currently working on a study of the influence of audience and purpose on the composing processes of engineers. In her paper, she will provide you with a preliminary report of her study.

ABSTRACT FOR BONNY STALNAKER'S "A STUDY OF THE INFLUENCES OF AUDIENCE AND PURPOSE ON THE COMPOSING PROCESSES OF ENGINEERS"

Bonnie Stalnaker of Rensselaer Polytechnic Institute provides a preliminary report on her study of the composing processes of engineers. Stalnaker discusses the purpose of the study to determine how audience and purpose influence the composing processes of writers in work environments. Stalnaker explains that the study concentrates on the choices writers make, especially in terms of how writers' perceptions of audience and purpose influence these choices. After an overview of her study, Stalnaker reviews related research on the composing process. She discusses the Flower-Hayes research on skilled writers, who show concern for audience and who shape discourse accordingly; the Bechtel research on skilled writers, who separate creating discourse from editing writing; the Perl research on unskilled writers, who error hunt from the beginning of composing; and other research on cognitive abilities demonstrated in writing. Stalnaker predicts that skilled writers develop skills and abilities to coordinate skills at will. Stalnaker's method to study the composing processes of professional engineers includes a modified version of Flower's protocol analysis, coding behavior based on Perl's work, and follow-up interviews. The results of her study will be presented in future articles. (RM)

# A Case Study of the Influences of Audience ar Purpose on the Composing Processes of an Engineer

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## Introduction

We academics often assume that teachers know best how to write and how to communicate effectively. We prescribe rules and methods and techniques and heuristics for our students and sometimes even test the effectiveness of them. We evaluate what our students write according to some often ill-defined criteria. We perform exploratory studies on what our students do when they write or compose--their composing processes. Although such studies have indeed described and compared composing processes of these writers, they tell us nothing about what goes on outside the classroom or education research laboratory. As a result, we have analyzed only writing that is a product of classroom teaching, classroom assignments, and classroom evaluation, and that's a very narrow perspective on the nature and uses of written communication. We need to find out about what goes on when people write on the job. This paper is a preliminary report on a study I am conducting of composing processes of engineers, managers, and scientists. The paper begins with an overview of the study, then briefly reviews related literature, outlines my research design, and reports on preliminary findings.

## Overview of Study

Because lots of effective communication goes on outside the classroom, I have been conducting a study of what these folks do--of their composing processes on the job. I want to find out how audience and purpose influence their composing processes as they write their own letters and memos in their work environment. Specifically, I want to examine their cognitive processes and physical behaviors to find out what factors influence the evolution of a piece of writing, in particular how the factors of audience and purpose enter into the process.

I want to look at the choices a writer makes during composing--in his/her head and on paper. By choices, I mean the points of decision that arise; thus I include the junctions in the flow of words at which the writer picks one word or sentence order or discourse organization over another. I want to know how the writer's awareness and perception of audience and purpose influence these choices and the relative time, in a linear view of composing, at which their influence occurs.

When people write, they demonstrate the behavior of moving an implement--pen, pencil, typewriter keys, or electric impulse--across a surface--paper or cathode ray screen. While this writing may be purposeful behavior of some sort--doodling or sketching--it may not be purposeful for communication. When communication is the aim, people must transfer cognitive activity--thinking--into physical activity--writing--through a process called composing. The process of transferring information back and forth between brain and paper is highly complex, and, as Flower and Hayes[1] explain, writers review and reshape their goals through the physical activity of writing and rereading what has been written.

Previous Research on Composing Process

Research has shown some general differences in composing processes of skilled and unskilled writers. As Flower and Hayes[2] report, skilled writers are crafty; they represent the writing task differently, put it in their own terms. They approach the writing situation with a great deal of concern for audience and purpose and shape discourse accordingly. Unskilled writers, on the other hand, if they demonstrate audience awareness at all, have difficulty transforming discourse to suit the needs of audience.

Skilled and unskilled writers differ in their views of the process as well. As Lutz has already mentioned, skilled writers are much more likely to view composing as a process through which discourse evolves through several drafts, while unskilled writers see one draft with cosmetic editing as the entire process. As a result, skilled writers demonstrate more inclination to get their ideas down in some form early in the process and to focus on organization with relatively little concern for mechanical and grammatical correctness. This doesn't mean that they ignore the conventions of standard written English, but that they worry about editing for these conventions later. Bechtel[3] found that skilled writers can separate creating discourse from copyediting. But unskilled writers, as Perl[4] points out, usually edit--or error-hunt--from the beginning of composing and do so often at the expense of losing the flow of ideas. This concern with correctness seems to be the guiding principle in their approach to the entire task.

Other researchers have examined how the development of cognitive abilities affects writing skills in different age groups. Much of this research is an outgrowth og the work of Piaget (see Phillips[5]), who theorized that development occurs roughly in stages; for example, children, as they reach adolescence, learn to express their ideas from the perspective of an other. We also find evidence for acquisition of cognitive skills on a more focused level: studies of how children coordinate pieces of information (e.g., Scardamalia[6]) show that abilities may be divided into levels according to complexity of coordination achieved.

This study of the influences of audience and purpose on composing processes of writers in professional situations is designed to build upon existing knowledge of composing in classroom situations We know with some degree of certainty that skilled writers represent their writing tasks more precisely than unskilled writers. We suspect that they have developed a hierarchically organized system of cognitive processes which helps them to handle the complexities of composing. Using this hierarchy of subsystems, writers may shift their attention from one concern to another as they refine the words and ideas they are trying to communicate. Constraints such as their perceptions of audience and purpose assist writers in channeling their ideas and composing into coherent discourse. In this way they not only respond to the rhetorical situation, as Bitzer[7] suggests, but they use the situation to guide their task as Consigny[8] suggests. Thus, a writer uses thoughts and words, as Vygotsky[9] says, to work back and forth between paper and mind to establish relationships among ideas. The success with which a writer handles composing, then, may depend on his/her ability to perceive the demands of the rhetorical situation and to manipulate cognitive processes and physical behavior to meet these demands. The characteristic way in which he/she meets the demands of composing is style.

## Design of This Study

I want to find out about only a portion of this cognitive processing by examining how audience and purpose influence writers. To find out about this relationship, I have studied subjects who are professionals educated as engineers who have jobs with management responsibilities. To make the situation as realistic as possible, I have asked the subjects to compose aloud as they write two pieces of discourse--each approximately 300 to 500 words long--in the normal course of their work.

I have used a combination of methods to study their composing processes: composing aloud, coding behavior, and follow-up interviews with subjects.

*Composing aloud* consisted of asking a subject to talk through the composing process while writing. Data thus included a written history of composing from beginning to end of the process--including all changes and drafts of the sample discourse.

Using the writing sample and the tape, I *coded behaviors* ~~(such as~~ writing, talking, writing and talking, pausing, and changing) on a time line at intervals of 15 seconds and noted choices considered during composing.

Because composing aloud omits some details of composing, I have conducted follow-up *interviews* to seek further information: description of kinds of writing done on the job, situation of sample discourse, and writer's goals in the samples. Another part of the interview is fashioned after a technique developed by Goswami and Odell working under an NIE grant and described by Odell in a talk given at the 1980 Modern Language Association. Their research method, used to investigate the composing processes of working professionals in public agencies, relies on post facto interviews with writers. After analyzing the writer's previous work to find recurring patterns of words, tone and structure, the investigator prepares a version of the writer's most recent product with options inserted at various points. In the interview, the writer is asked whether he/she would be willing to change what he/she has written to one of the proposed alternatives, all of which are known to be "real" options for that writer since they have appeared in his/her earlier writings. From the writer's responses in the interview, the investigator infers the manner in which he/she represents to him or herself the problem addressed.

*Results of Research on RD*

The following discussion of one subject in this study is an analysis of the results obtained using the investigative techniques described above. This discussion includes details of his job, writing tasks, and general composing behaviors; his sample discourse; and the influences of rhetorical situation on his composing.

*Job, Writing Tasks, and General Composing Behaviors*

RD is the Manager of Advanced Electrical Engineering in a major manufacturing firm in the Northeast. During the interview he reported that the writing he does consists of three kinds: (1) memos that report his analysis of technical data on the firm's products to managers in other departments who have asked his assistance; (2) annual employee performance evaluations, to his supervisor, that support his recommendations for firing and raises; and (3) employee recommendations, to his supervisor, for awards. His writing samples for this study fall into the first category.

According to the tapes, RD begins his composing with comments about the situation he is writing for and quickly begins talking and writing. He works through an entire draft pausing for only five to ten seconds at a time and making only a few diction changes. The pauses usually come between sentences when he is deciding how to proceed. When he does have trouble getting his thoughts focused and clear within a paragraph, he usually rereads the previous phrase once or twice and then moves valiantly forward.

Between drafts he went through the processes of rereading and rethinking without recording these processes. When he begins a second draft, he usually refines the word choice and condenses the information in the first paragraph. The other changes are primarily organizational: he adds or reworks topic sentences and rearranges facts for greater coherence. He also elaborates central points in the body of the discourse.

## Sample 1

### Rhetorical Situation

The rhetorical situation in this memo is a typical example of a technical memo reporting data analysis to a manager in another department. The exigence involves the reader, a manager from Design Engineering, who had been asked a technical question by a marketing representative fielding a customer inquiry. Because the design department did not have the expertise to perform the analysis, the reader asked RD to help.

The reader is a manager on the same level as RD, one whom RD communicates with approximately two to three times per week orally and twice a month in writing. Noteworthy results of tests RD has run warrant a routine written report to the inquirer in another department or subsection. Ordinarily, the reader uses RD's memo to form a response to the customer. When asked during the interview whether the customer receives his memo directly, RD replied, "If I knew it was going to the customer, I'd have said it in a different way--twisted around the facts."

RD's goal in this memo, which also provides a constraint, was to pass on the results as quickly as possible. Because the reader's question was spurred more by curiosity than necessity, RD primarily wanted to "get the memo out of the in-basket!"

Composing Process

As is typical for him, RD begins talking and writing with very little recorded planning and, according to his interview comments, no unrecorded planning. After writing the opening two paragraphs, he comments about his audience: "I want to let Chris [reader] make sense out of what I want to talk about." He writes the entire first draft in 16 1/2 minutes. He then explains that he will approach the second draft in this way: "I will cut pieces out and regroup the comments I've made to make it [draft] flow more naturally. I will say the same thing but in different words."

The second draft takes 12 minutes. He pauses more frequently to reread clauses and phrases to change word choice. At the end of this draft he says he "has most of the pieces. Now I will look at the words and find gross errors and have it typed." He records none of this changing on tape.

Sample 2

Rhetorical Situation

RD describes the rhetorical situation of this memo as "political." It is a typical example of a written confirmation of an oral agreement. The reader is ranked one level higher than RD and works in a different sub-section of the same department. The reader has complained to RD about stringent quality control requirements and has asked that they be relaxed. RD has agreed to conduct tests on the problem to determine whether his group can justify relaxing the requirements. The memo responds to this exigence by explaining the plan for testing and analyzing data.

During the interview RD reported that he wanted to accomplish three things in this memo: (1) try to get along with the reader; (2) provide his view of the background of the problem; and (3) explain what RD's sub-section cares about and how far they can bend their priorities. Although this memo is routine, it does include an additional constraint related to audience. RD explained that because the reader is new to his job RD provided more detail on background of the problem than he would have done with a similar request from more experienced section managers.

Composing Process

RD begins composing aloud by briefly explaining that this memo is primarily political; everyone involved knows the agreement, but the memo will function to record that agreement when RD has moved to his new job. After 30 seconds he starts talking and writing and continues through two-thirds of the memo hardly pausing to catch his breath. After 7 minutes 45 seconds, he stops to tell me again that this memo is political and that the results of the testing will determine action on the requirements. The first draft takes 19 minutes 20 seconds to write.

RD chose not to record comments while reworking the draft. His plan is to "correct sentence by sentence or add a comment or make it more intelligible." He will explain changes in the margin if they "aren't intuitively obvious."

Influence of Rhetorical Situation on Composing

For RD, audience and purpose are extremely important factors in composing. He seems to have stored in memory a general problem representation for handling writing tasks like those in these samples. The range of complexity in these situations varies only a little--the reader is different in personality or experience, but the role of the reader remains virtually the same. The exigence and constraints also offer little variation. As a result, RD can use this well-developed schema as a mechanism for discovering what information from the data he needs to report and for controlling the way in which he reports it.

His representation of audience and purpose do no change noticeably during composing. The one exception is in the first draft because of new information acquired during composing. One of the changes he made between drafts was to remove a sentence after conversing with someone on the telephone; he said the change was for political reasons. Although he referred only infrequently to audience and purpose while composing aloud, he repeatedly commented on their influence during our interview, both as he answered questions about the nature of his writing tasks and as he responded to the alternative words and phrases I supplied for his memos.

He clearly uses his perception of his reader and his purpose in combination to guide his selection of details, arrangement of details, his tone setting in the opening and closing, and the extent of his reworking. In both memos, arrangement was very direct; he reported results and procedures in sequence because he was communicating technical information to readers knowledgable in the field. To some extent the purpose dictated choice of details--select details of results that answer the reader's questions. But especially in the second memo, audience was a factor--a new man on the job needs extra specified background about what questions the tests will help answer.

The influence of audience and purpose on tone is particularly interesting. RD's finished version of the first memo begins

> This note is in response to your letter of February 11, 1981 asking me to analyze the combustible gas-in-oil results taken on three of your EW1175 potential transformers.

Because the memo reports that results show nothing "unusual or alarming," I offered this alternative:

> I am glad to report that I see nothing of major concern in the combustible gas-in-oil results as reported in your letter of February 11, 1981.

RD was quick to reject that alternative because his reader "wouldn't have read the rest of the memo!" Since RD feels that the reader asked for the analysis out of curiosity, he certainly wants the reader to read his report!

The close of this memo also demonstrates awareness of audience:

> I would like to see the data on the next several units as it becomes available.

The alternative:

> Please send me the data on the next several units. . .

Again RD was quick to reject the alternative because it is not appropriate for the reader: "He has a big ego and doesn't like for anyone to tell him what to do. So I just say that I'd be interested."

Purpose more than audience seems to guide his decisions about reworking drafts. He reports that the process of draft-quickly, clean-up-and-clarify, and send-to-typist is his usual procedure for technical memos. When offered alternative verbs that suggested more precise and less colloquial choices, he was willing to make the changes: "That's me, the Missouri farm boy. You can see that I don't worry too much about some details of language." But he is less willing to change adjectives because they were apparently chosen with greater care: the tapes show that he stops to consider them while composing. He rejected the alternatives because they did not capture the meaning he intended.

This concern for a particular part of speech does not occur with any subject except RD. An explanation for this phenomenon may lie in the notion that technical writing tends toward nominalization--a large proportion of meaning is carried in nouns while verbs tend to be weak. If such were the case, then adjectives modifying nouns would be more central to meaning than adverbs modifying verbs. RD's commitment could be interpreted as evidence for that notion.

Using his stored problem representations, RD begins composing with many choices related to both audience and purpose already made. Many of the detailed choices that remain occur as he is generating the first draft. The adjectives, which he considers so important, get attention immediately at the time of generating. Other changes--related to syntax and conventions of language--take place during subsequent drafts and final editing.

These results suggest that a strong sense of audience and purpose are essential for planning and producing effective discourse. In the case of this writer, these factors are what he uses to guide composing from beginning to end, and without them--as in the situation of handling his new job--he says, "I don't know what to write!" If further research supports this evidence, then we must adapt our teaching accordingly by helping our students learn to represent their rhetorical problems to guide composing. When we find out more about how people accomplish writing tasks to transact the day-to-day affairs outside classrooms, we should have a better idea of what makes for effective composing processes that do more than simply get one through a classroom assignment or a required course. Then we will be able to design methods and assignments that lead cognitive development in the direction of skills demonstrated by effective writers.

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The work of Jean in theory and Bonny in her specific study suggests several implications for technical communication teaching and research. Carol Hughes, who teaches organizational and business communication at State University of New York, Buffalo, will provide you with some of those implications for our teaching and researching.

ABSTRACT FOR CAROL HUGHES' "PROCESS-BASED PEDAGOGY AND PROCESS RESEARCH: IMPLICATIONS OF THE COMPOSING PROCESS IN TECHNICAL COMMUNICATION"

Applying theories of composing to technical communication, Carol Hughes of State University of New York--Buffalo discusses pedagogical activities for using the composing process in the classroom and topics for researching the composing process in technical communication. Hughes explains teaching guidelines for applying composing processes in the classroom. Under contextualization, she suggests specification of rhetorical situations in writing assignments by requiring students to provide statements of topic, audience, and purpose. Under translation, she suggests using Bradford and Whitburn's idea of having students discover intended audiences by examining several documents prepared on one topic and written by the same author. She suggests also having students write for a specific audience through choosing and arranging facts to suit that audience. Under revision, she suggests requiring students to review each other's writing to evaluate the extent to which the writing satisfies the needs of audience and purpose and thus to make students do more in revision than just edit. In the second half of her paper, Hughes explains the need for theory to guide research in the composing processes of technical communicators. After explaining the dangers of narrative studies and sequential models, Hughes suggests uncovering basic composing processes in terms of who writers in technical communication are and what writers are doing in technical communication. Using Odell, Cooper, and Courts' approach to research on composing, Hughes then indicates that researchers need to examine what writer characteristics matter to persons communicating technical information, what relationship purpose has to audience in technical communication, how writers approach the different forms of technical communication, when composing skills in technical communication can be taught, how writers of the same genre can be evaluated, and how a writer's work in different forms can be assessed. (RM)

# Process-Based Pedagogy and Process-Based Research: Implications of Composing for Technical Communication

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The other speakers in this session have presented a case for a view of technical communication which goes one step beyond rhetorical perspectives, which emphasize the importance of audience and text and their interactions with the writer's intentions. Their contention is that stressing the rhetorical nature of scientific and technical communication--although it has provided understanding of the nature of the role of technical discourse--does not provide a rich enough foundation for (1) explaining the steps writers actually go through in producing text and (2) generating research questions.

In applying theories of composing to technical communication, as Stalnaker has noted, we must treat separately the problems of pedagogy and research. I intend to do that. First, I will discuss several specific classroom activities currently being used by teachers of technical communication, and relate them to the elements of the composing process described by Lutz. Then I will address the question of how to generate research from the issues raised here today, and from research questions already raised in the literature.

## 1. Process-Based Pedagogy

In presenting my ideas to you, I anticipate a difficulty analogous to one discussed by some of the very people involved in developing composition theory: How do you take a continuous process and, while remembering that it's continuous, break it down into manageable pieces? My challenge is not unlike that facing you as writing teachers; I want to offer some guidelines for applying a process-- not for achieving a specific product.

Assuming that we can teach students to apply general principles throughout the composing process, we can also learn to apply general principles throughout the process of pedagogy. The light at the end of my tunnel, however, is the hope inspired by the very people who raised the question of how to apply a process as a pedagogical point of departure. For example, Kinneavy[1] reminds us that writing requires many skills--and coordinating those skills is no mean feat, especially for inexperienced writers. Nevertheless, he reassures us, a sense of purpose can be taught simultaneously with the separate skills necessary for producing discourse. And Flower[2] has constructed a landmark textbook based on the principle that students can learn to be effective writers if they can (1)achieve a sense of how to see things from their readers' points of view and (2)develop the ability to provide a hierarchical structure for a set of propositions.

I will now describe some of the tacks currently being taken in the technical writing classroom and relate them to Lutz's three elements of composing.

1.1 Lutz's Elements

Here are Lutz's elements, stated briefly, in my terms:

1. Contextualization--drawing boundaries for who is the audience and what they will be told;

2. Translation--organizing, making logical connections, and creating the meanings necessary to convey the intended message to the audience; and

3. Re[illegible]-checking and rechecking to be sure that not[illegible] has interfered with translation, and that noth[illegible] violates the exigencies of contextualization.

1.2 Contextualization

One guideline for designing assignments is to require specification of a rhetorical situation. Although we may sometimes provide these details, we must also require students to specify who they are talking to and what they are trying to accomplish. How else will they become adept at seeing context for themselves?

For example, we can ask students to provide statements of topic, audience, and purpose early in a course, for their own use in several assignments. Some may resist the system, claiming that they cannot respond to a vague assignment--they are saying, as I see it, that they <u>cannot</u> develop context for themselves, even if they have a topic which interests them. One option that's always available is sending them out on an information-gathering expedition. Send them to reference librarians, newspapers, government agencies, corporate public relations departments--you name it--and see if they can't come up with a burning issue of relevance for a specific audience.

Once you sell students on this type of assignment, you have one big advantage--they are likely to be highly committed to their projects and therefore are more likely than usual to do their best work. And you know that they have--at least once--

gone through the contextualizing process.

1.3 Translation

I would like to approach this part of the composing process both backward and forward.

First, the backward approach: Bradford and Whitburn[3] have an article on audience analysis forthcoming in The Technical Writing Teacher in which they describe an excellent assignment. Groups of students are asked to analyze the opening paragraphs from several documents prepared on one topic for different audiences. Students are to analyze the techniques, and the qualities of writing, that signal who the intended audiences are. In the end, the students find out that each of the articles was written by the same author and for different journals. Students learn how the same information can be manipulated for five very different audiences, and they see the product of composing; then they try to recreate parts of the process.

We can also approach translation from the front end--that is, by asking students to do it themselves. In the old days before the birth of rhetoric in the clothing of technical communication, we might have assigned something like this: "Describe a mechanism that you use in a freshman laboratory course." We can amend that assignment, however, to this: "Describe a mechanism that you use in a freshman lab course so that someone who has never operated it could do so."

The students can then choose and arrange their presentations of the multitude of facts they have to suit the audience and purpose specified. Note that we are making progress toward using the processes of composing in discrete steps; we are not requiring students to apply all of the components simultaneously--yet.

1.4 Revision

I'll move now to some possibilities for assignments designed to help students polish their revising strategies. But first, I'd like to emphasize what I mean by revision: as Lutz has said, revision is an integral part of the process of composing, not an activity that takes place after composing is finished. Specifically, what I am talking about is techniques by which students may use the composing process to help themselves refine their writing--at any and all times during the process. Studies of revision (Sommers[4]; Bridwell[5]; and Perl[6]) show that students try to revise by correcting errors--they put bandaids on sentences or phrases to guard against losing points for mechanical and grammatical disasters. But we want them to review their prose from the standpoint of their own goals with respect to audience and purpose--and also edit for errors.

One sure-fire way of doing this is to have them comment on each other's papers and evaluate the extent to which the papers satisfy the needs of the audience and purpose--of course, we are always working with papers which have attached a description of audience and purpose. Second, we can have students use the class as an intended audience. Again, we are requiring audience analysis--students must exchange information about each other so that they can get a fair picture of the class's background and prior knowledge. Using this background, we may ask the students to write persuasive and informative documents; exchange them; and see how successful they were at both analyzing their audience and writing to fulfill the needs of the audience.

I know an instructor at one school who begins technical writing courses by requiring students first to write directions to some out-of-the-way place on campus, and then to follow other people's directions to that place. The assignment is a good introduction to the weakness in the assertion, "It sounds good to <u>me</u>."

### 1.5 General Guidelines for Process Pedagogy

To summarize, I will restate the principles these assignments are intended to address and to instill in students. First, the contextualization assignments--asking students to provide their own audience and purpose--should be used with the guiding principle that students must be able to create goals from the information at hand, and from even the most vague requirements for a project.

Second, when you dish out an assignment designed to offer practice in translation, remember that we want students to see how organization, logical connections, and meanings work together to make a document accessible to its intended readers. Don't allow them to become waylaid by trivial details--they can correct spelling and punctuation later. Work with them until they understand the types of options available to any writer even before a word is committed to paper.

Finally, when you emphasize revision don't present it as a final step at the end of the road, designed to wipe away smudges. <u>Revision</u> is not <u>copyediting</u>. Any alteration to text--at any point in time--constitutes revision; and no decision to alter text should be done without consideration of its effect on interpretation by intended readers.

## 2. Process-Based Research

Now I place you and myself--as researchers--in the same boat with the students we are trying to reach with our process-based pedagogy. We have all read articles that are lucid and reasonable calls for research on composing. But often these articles omit something we teachers of composition are requiring of our students. That is, they do not always ask: What are our goals? What are our objectives? What are the questions we need to ask? What are the questions to which we must have answers? What is the bare minimum for which we will settle?

In other words, what kind of theory should guide our research? What standards must our studies meet, and what information must they provide? The literature on problem-solving and decision making tells us that we need alternatives and objectives before we can choose among the options available to us.

Toward that end, I want to address some general issues surrounding research into the composing process in technical communication. First, I will review some of the limitations imposed by the nature of the subject under study. Then I will borrow some "unanswered questions" from composition research and interpret them in the light of the special tasks of the technical communicator.

### 2.1 Limitations

Sondra Perl[7] has explained one dilemma facing composing research, which applies equally to technical documents. Experimental work done in the past has not--by and large--provided us with the rich constructs we need to describe the phenomena under investigation. As a matter of fact, a lot of the experimental work done in the past can't even help us to identify the phenomena we are interested in understanding. As a result, many of us are now moving toward case studies, or detailed investigations of the writing processes of very small numbers of people. These studies provide rich narratives and detailed protocols of people's experiences during composing, and only through such studies can we come up with psychologically real constructs to guide future inquiry. As Perl notes, however, we need to make another theoretical maneuver--from narrative results to controlled studies. That is, we need to discern in our narrative material recurring patterns and generally applicable constructs so that we may use them to build theory. Only with generally applicable theory can we derive testable propositions for research and generate applications for use in both pedagogy and practice. We must balance the benefits of generality against those of specificity.

A further limitation, already alluded to in the earlier discussion of pedagogy, is the threat of sequential models. Linear stage models have a way of creeping in, even in spite of the most well-intentioned assumptions and premises. It is possible--as Flower and Hayes[8] demonstrate--to use graphic representations of a process, without reverting to a sequential model. But once a process has been broken down into discrete elements, its inventors have moved one step closer to a stage model, where the steps are assumed to be sequential and isolable in time. We must fight the temptation to order temporally the models we construct.

2.2 Unanswered Questions

Most composition theorists would agree that, in general, the main thrust of our inquiry should be to uncover "basic processes" in composing. In this session, we are moving toward an approach limited to technical communication which addresses this general question from the standpoint of the writer. But what is it about the writer and his standpoint which matters to technical communication? What more can we say? I will speak to two questions: (1) Who is the writer? (2)What is the writer doing?

2.2.1 Who is the writer?

We talk about "interactions"--for example, among writer, text, and situation. In this case, then, before we bandy about propositions about the ways in which writer, text, and situation interact, we must be more specific about what we mean by "writer." Stalnaker has made this point already in her research into the composing processes of professional writers. How will her results compare to results of studies using students at various levels of development and in various situational contexts?

We have means for describing and defining components of text and of situation. But what must we consider about <u>any</u> writer? Must we consider age, sex, or vocabulary? Should we apply some measure of development, or administer beforehand some task to gauge each subject's writing abilities? If so, which abilities must we consider? To focus on technical communication--do the same writer characteristics matter to a person communicating technical information? Should we concentrate on organizational skills, for instance, and omit for now any reference to the use of figurative language?

2.2.2 What is the writer doing?

Odell, Cooper, and Courts[9] have provided an extensive list of unanswered question in composition research, which they divide into four sections: questions about the composing process, questions about published writing, questions about writing done at different age levels, and questions about eliciting and assessing writing performance. I would like to make a brief pass at each of these in an attempt to sketch an agenda for technical communication per se.

One of the big questions related to the composing process is, What is the role of purpose? Lutz has sketched for you some of the connections between classical rhetoric and composition theory, underlining the importance of a sense of purpose in technical communication. In her own discussion, and in the discussion of other composition theorists--purpose with respect to audience is but one of many goals guiding the author. What then is the relative importance of purpose? When will--or should--goals about one's image or goals about proper terminology override goals about the actions one desires from one's audience? Stalnaker addresses this question with her concern for what guides the choices a writer makes and how audience and purpose influence composing.

Under questions about published writing, we may consider the difficulties of categorizing texts. The forms used in technical communication may help us to develop generic divisions for technical communication. But what shall we do with them? What can we ask about how writers approach--or ought to approach--composition based on different forms of technical communication?

I have alluded briefly to questions related to writing done at different age levels. At what ages or levels of development can we expect people to handle not just the complexes of skills necessary for all writing, but also those especially required by technical communication? Given that most technical communication requires specialized knowledge of a subject, when do we begin teaching the forms of technical communication to students? When will they be able to use them? And how will we be able to figure this out?

Finally, questions about eliciting and assessing writing performance: does type of discourse differentiate among writers? Will a writer be "good" at one type, but not at another? If so, based on my discussion, the implications for technical communication are profound. The questions for research could be based on development of generic divisions of technical communication--possibly based on existing forms--and would be designed to explore qualitative differences among different writers in the same genre and among each writer's work in different genres.

Most importantly, all of these research topics must be applied to more than just students--to many situations outside the classroom where writing is being done. So maybe we need more than articles and research based on descriptive studies. We need cooperation and brainstorming among theorists and researchers to try to develop some sense of direction--so that a theoretical foundation may be laid for fruitful research to develop more fruitful pedagogy.

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Vivienne Hertz, our last speaker, will provide a further view of the composing processes in technical communication. Vivienne has studied at Illinois State and Southern Illinois University and currently teaches technical writing and commercial graphics at Southern Illinois University. Vivienne is also one of SIU's School of Technical Careers Flying Faculty; that is, she flies to military bases in the South and West to teach technical communication. In her paper, Vivienne will explain her view of the composing process in technical communication as creative experience.

ABSTRACT FOR VIVIENNE HERTZ'S "THE COMPOSING PROCESS IN TECHNICAL COMMUNICATION"

Vivienne Hertz of Southern Illinois University considers some of the forces that students experience in technical communications. Reporting on a survey of teachers in technical writing, Hertz suggests how teachers can use elements in report writing to enhance the process of writing. The survey dealt with questions related to problem solving, paper evaluations, and individualizing instruction. Hertz suggests that teachers recognize (1) that because students want to succeed, teachers must create an environment that makes success possible, (2) that peer group activity can play an important role in helping students respond to writing assignments, and (3) that relevant assignments will encourage growth in abilities and help motivate students' interests in writing projects. (RM)

# THE COMPOSING PROCESS IN TECHNICAL COMMUNICATIONS

Vivienne Lucas Hertz, Ph. D.
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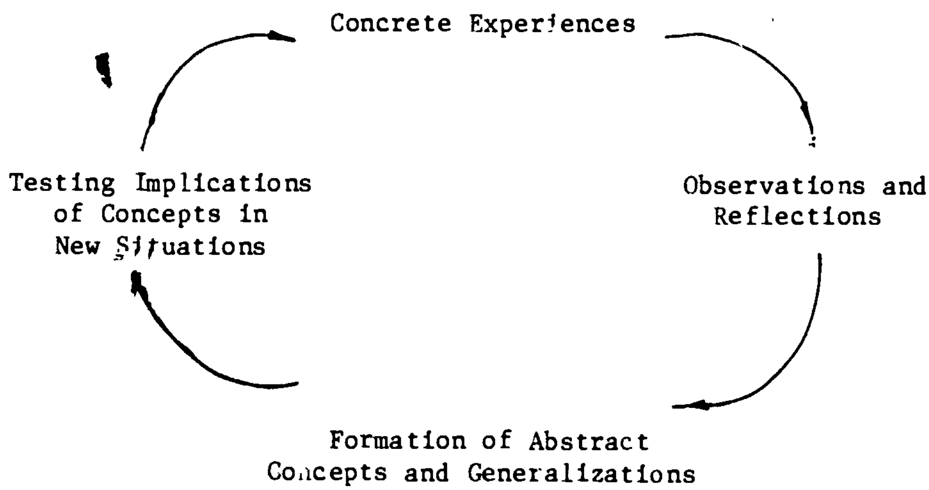
As a teacher of technical communications with some thirteen years invested in an experiential rite of passage, I have some observations to share. As a researcher, concerned with inferences that can be drawn from classroom encounters to direct planning for future courses and curricula, I hope to present some findings that you might find of value. You don't have to agree with the conclusions, but for awhile let's consider some of the forces that cause students to experience increasing success in technical communications. In this communal effort, we must also acknowledge the mirror images--those forces that cause students to fail or, worse yet, cause them to decline to participate because of fear of failure.

These observations come from working with increasingly diverse groups of students--often those once presumed to dislike written communications or thought to have little chance of success with any kind of writing, much less sophisticated reporting. Our course planning no longer centers on traditional eighteen or nineteen year olds who come straight from high school to college, already committed to a career choice from which they will not deviate during the four years required for a bachelor's degree. Our increasingly diverse classes find the traditional Joe or Jane College sitting next to someone's mother, grandfather, or pen pal from another continent. The campus classroom also may be geographically located in a shopping center, on a military base, or in the professor's office. We are indeed in a period of change; we must recognize diversity in our students, must become flexible in planning curricula, but not "water down" the expectations for students to leave our courses more skilled that they were upon entering.

This discussion will not stress research other than to describe the theoretical construct under which the exercises operate and to share briefly some results from a 1977 survey distributed to a random sample of teachers of technical writing. The survey was part of a large study, in fact, my doctoral dissertation, to develop materials that did not stress prescriptive formats, that did draw on diverse elements in report writing to enhance the <u>process</u> of writing. Implicit in this concept was that as individuals we have differing learning styles as well as differing ways to process information. Particularly appealing was the experiential approach being advocated by some industrial pyschologists. Kolb's Model of the Learning/Problem Solving Process, based on Kurt Lewin's earlier conceptualization of the individual's life space, described the four stage process as starting with concrete experiences. Kolb's model has gained increasing acceptance in industry, and in counseling strategies to use with clients of learning resources centers. Professor Sean Boyle of the University of London has done related studies with adult students.




Kolb's Model of the Learning/Problem Solving Process

Another observation worth making at this point is that Piaget's theory of developmental reasoning--so attractive in science teaching--is similar but it presents the distinctions between the concrete and the abstract as part of a maturity continuum--one that correlates with the individual's intelligence. The key then to the thinking behind this theory of learning being advocated as a theory of teaching is that we try to emphasize different from more than better than. Also we need to create an awareness in the individual of ways to increase inventiveness, productivity, and not the least--self-confidence in his/her own ability to do well.

The survey mentioned earlier was distributed at a technical writing session of the Four C's (College Conference on Composition and Communication) in Kansas City, March 1977). Part I of the survey surveyed areas of agreement/disagreement related to problem solving, paper evaluation, and individualizing instruction. The first set of statements included:

1. Teaching technical writing through problem solving should be done.
2. Self-assessment is a viable part of a student's progress in a technical writing course.
3. Each piece of writing the student does should be graded by the instructor.
4. Cognitive-field theory, as defined in the proposed guidelines, is a logical theoretical base around which to develop a technical writing course.
5. Some parts of the technical writing course could be converted to self-instruction.
6. Problem raising is a legitimate concern in technical writing.

7. It is possible to individualize instruction with larger groups of students.
8. Technical writing can stimulate technicians or technical students to expanded insights.
9. Different goals for different students are possible in college level courses.
10. Technical writing is by nature a prescriptive course.

The table below shows the range of responses to nine of these statements. Pertinent to this discussion is the agreement that we are about the business of raising problems, even trying to solve them, and hoping all the time that we increase students' awareness--expand their views of their world--or environment--or self. One might also add that we are suspicious of psychological "claptrap" even when we agree with the theory.

IDENTIFCATION OF SELECTED ATTITUDES/PRACTICES

| Item | N | Strongly Agree | Agree | Undecided | Disagree | Strongly Disagree |
|---|---|---|---|---|---|---|
| | | Percentage of Responses | | | | |
| Problem Raising | 31 | 38.7 | 58.1 | --- | --- | --- |
| Problem Solving | 32 | 53.1 | 40.6 | --- | --- | --- |
| Expanded Insights | 32 | 75.0 | 21.9 | --- | --- | --- |
| Cognitive-field | 29 | 6.9 | 20.7 | --- | --- | --- |
| Differing Goals | 32 | 56.3 | 34.4 | 6.3 | 3.1 | --- |
| Self-Assessment | 31 | 38.7 | 48.4 | 9.7 | 3.2 | --- |
| Grading by the Instructor | 32 | 28.1 | 15.6 | 6.3 | 34.4 | 15.6 |
| Self-instruction | 32 | 25.0 | 53.1 | 9.4 | 9.4 | 3.1 |
| Individualizing for Large Groups | 32 | 34.4 | 37.5 | 21.9 | --- | 6.3 |

The main statement about which there was disagreement was the need for the instructor to grade each piece of writing that the student produces. Those who had taught more than ten years were much more reluctant to share the responsibility than those who had taught fewer years. We are divided in our perceptions of the nature of the course. Half of the respondents, strongly agreed or agreed that technical writing is a prescriptive course, another twelve and one-half percent were undecided, while the remaining thirty-seven and one-half percent either disagreed or strongly disagreed.

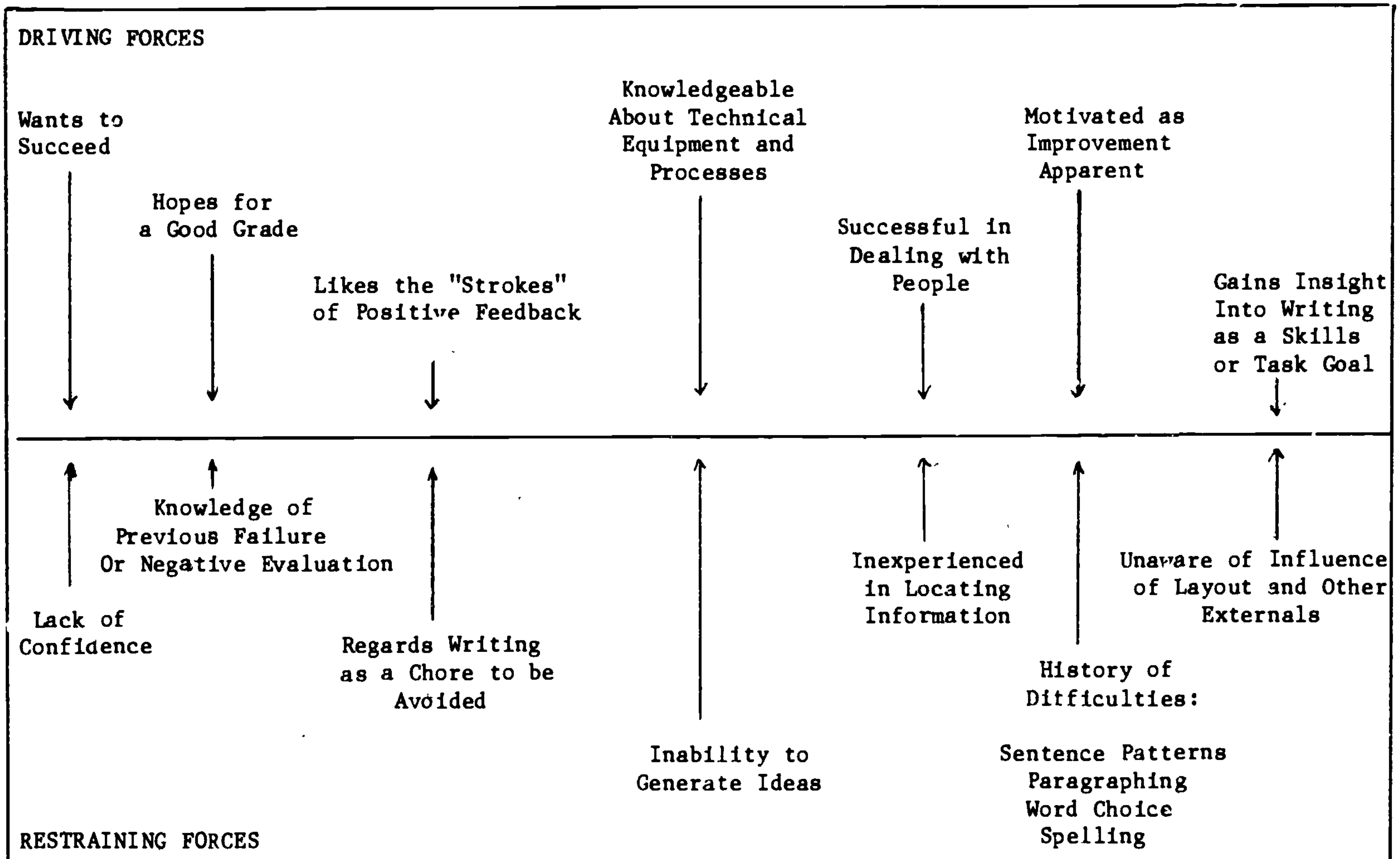
It doesn't matter that we teachers don't agree whether technical writing courses are prescriptive or not. Some elemets are prescriptive; some are not. Prescribed formats avoid placing obstacles in the reader's way. We plan for their expectations and smooth the path for an expeditious journey. On the other hand, at times creative experiments with standard formats produce efficient, pleasing results. Look how graphics have moved into an integral role in so many sets of instructions. Consider how more efficient information mapping is for troubleshooting. Skim reading such charts allows readers to select only the information germane to their problems.

What then should concern us in contemplating the composing process? Many diverse elements, but for now, let's consider recognizing that:

1. Students want to succeed. We need to create an environment that helps make success possible.
2. Peer group activity often can play an important role in helping some students who might not respond through lecture or individual study.
3. Relevant assignments, or simulations students perceive as relevant, will encourage growth in abilities and help motivate students' interest in writing projects.

Students want to do well. What can we do to help them? First of all, we need to recognize forces that serve to push and pull, drive and restrain them. Many of the technical students that enroll in our classes have not done well in previous F ' classes in high school--or even in college. But they are skilled in way ' t many of us are not. They may have better hand and eye coordination; they may have more analytical minds that can help them in shop situations, with design problems, and even in communicating technical information orally to supervisors or peers. But they may lack confidence in more formal situations or they may dread writing reports. The theoretical model on the next page depicts some driving and restraining forces.

THEORETICAL MODEL: FIELD OF FORCES,
THE INDIVIDUAL AND TECHNICAL COMMUNICATIONS




Adapted from Kurt Lewin's Field of Forces
(From _A Dynamic Theory of Personality, Selected Papers_, 1935)

We can help them if we:

1. Discuss with students some of the barriers--real or imagined--that hinder their writing efforts. Go beyond the grammatical concerns, problems with spelling. Start to explore time management, work habits. Often I start classes, especially with adult students when I send the reading assignment prior to the first class meeting, by asking students to write an introductory memorandum outlining their personal goals for the course. Responses often reflect work habits, attitudes, and expectations,

"I hope to remove my mental block towards writing."

"My major problem is being too lazy to read the information I need. If I develop skills in information gathering, I should be able to produce better work."

"All I want to get is an A."

Even more perceptive responses come when you ask for anonymous statements.

2. Start directing their critical skills into the current subject matter of their intended fields. Having even a cursory knowledge of issues related to their major helps in developing handouts planned for their specialty. Several of the self-assessment sheets that proved useful with the above suggestions are attached to this paper.

3. Let students experience success early in the course. One exercise that I have used for the past several semesters is to involve oral communications as the basis for their first paper. Three students volunteer to teach the class something they consider we would find interesting or something that we should learn how to do. These students teach us through demonstrations, sets of directions, or through answering questions posed by the class. The writing assignment is for the rest of the class to write a set of directions based on one of the reports. These directions would be intended to instruct someone how to perform the process without having heard the oral presentation. The papers, for the most part, have been well written--not really too difficult to write. Topics that worked well were "How to Select a Used Car" (tips from an automotive student), "How to Save a Person from Choking," (from a licensed EMT), "How to Dry Mount Photographs for Less Than $2," even "How to Break a Thick Board with Your Hand." With such activities, the students who takes notes well, asks the right questions, can write coherent papers. Of course, the verbal skills of the speakers affect the content and its organization.

Peer group enterprise can help in ways that supplement what the instructor is hoping to make clear. It can also not work well when class members think that they are being asked to critique peers' work to make quality judgments that will affect grades. Dividing the class into editorial committees and charging each group with a particular task--layout, completeness, unanswered questions, even grammar and spelling --will succeed if the writing is returned directly to students to allow them to incorporate suggestions prior to a grade evaluation. A word of warning is in order. Too much ity to those who may offer misleading or even incorrect advice works against the effectiveness of the exercise

One exercise that has been of value in helping students produce coherent, logically developed outlines involves the class as a group. The class helps select a topic for a research report that all might choose to develop. As an in-class activity all class members develop an outline independently according to their perspective of a logical format for organizing the report. After a given amount of time, names are drawn randomly for three people to put their outlines on the board, and for three others to serve as judges who will determine the winner of these three outlines. First of all, the judges read the three outlines and write down the order of their choices independently. Then the author of the outline presents it to the judges and the class, answering any questions from either group. Then the judges orally, in front of the class, come to a unanimous choice of their preferred outline. This competitive interaction can help to show how concepts of exact audiences and purposes for the report can affect the individual's conceptual organization.

The preceding exercise came about almost spontaneously with a class of adult students. It seemed to break a policy that I have tried to maintain throughout teaching--not to criticize a person's writing in front of others, especially the entire class. Strangely enough, this exercise takes on a more positive dimension. Sometimes the judges have changed from their original choices after hearing the oral defense. That process leads into the need for answering some of their questions by revising wording in the outline. The random selection of both participants and judges makes the process have an aura of fairness. And, the outlines that students have written in planning their own reports have been much better than those written in other classes that did not participate in this activity.

<u>Making assignments relevant, allowing students opportunities for creative problem solving, and then planning for ways to offer assistance or help them move towards increased confidence in their skills</u>--aren't these valid objectives for us as we look at the composing process? I would like for all my students to receive A's from the course--but I know they won't. But it is not an unrealistic objective to hope that they leave the class with increased writing skills and a growing awareness of the diverse elements that bond together the process of composition.

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Tichy, H. J. <u>Effective Writing for Engineers, Managers, and Scientists</u>. New York: John Wiley and Sons, Inc., 1966.

Some people think they do not write well and dislike report writing. Others find it a real challenge and enjoy meeting its demands. The rest of us fall somewhere in between depending on the reason for the report and the pressures of our other commitments. One can wonder how much the process of writing affects the end product and our attitude towards the task. Why not ask yourself these questions:

1. Given a choice, I prefer to

___ Write.

___ Phone.

___ Talk directly to the person with whom I am communicating.

2. Directed to write a report, I usually

___ Think about it for several days, and then get started.

___ Get to work immediately so it can be finished as soon as possible.

___ Put if off as long as possible.

3. My composition process goes like this

___ A satisfactory report written in a single draft.

___ Three or four revised drafts before I'm satisfied.

___ Draft, edit, revise.

4. My revisions are usually for

___ spelling

___ punctuation

___ word choice

___ sentence order

___ clarity

___ brevity

5. For reports with which I am extremely careful

___ I do all the editing.

___ I ask a colleague to read them over.

___ My secretary can be depended upon to catch all errors.

One final question you might ask yourself:

When I complete a report, I feel ______________________________

If you are interested in how others approach the process of report writing, you would enjoy reading H. J. Tichy's discussion of writing from the standpoint of the stages involved. Her discussion is summarized on the next page in terms of four steps: Plan, Write, Cool, Revise. The last step, she calls "purposeful revision" that contains five necessary steps itself.

1. Ask two questions--

   a. Does this paper contain all the material that my reader needs?

   b. How much material can I remove without interfering with my reader's understanding and needs?

2. Strive for clarity--

   a. Rephrase ambiguous expressions even though you think that the reader will know what is meant. "A reader should never be given the opportunity to think, 'Well, I know what you mean to say because I know what you ought to be saying, but you haven't said it.' As soon as a reader must supply what a writer intended to say, the writer has failed." (13)

   b. Know how to choose the best word for your meaning, how to make sentences clear, and how to construct paragraphs that develop the meaning helpfully and clearly.

3. Correct the writing. Think in this reading in terms of errors.

4. Strenuously attempt to reduce the number of words.

5. Attempt to develop a better style, advanced work, in this final revision.

An example of decisions which face people on their jobs can be seen with dental technicians and the choices they must make to advocate or fight against denturism, a growing movement in the United States. Denturism is the practice of a technician dealing directly with a patient who needs dentures. The dentist serves a lesser role in the process, with the public paying less and the technician receivng more for his services than he does currently. Obviously, there are divisive attitudes toward this movement.

Some consider denturism simply as "bootlegging" done by the unethical. Others view it as the movement of the future. People entering the field and those currently working in it are going to be forced to take sides--to make a reasoned and ethical decision of their own stand.

All professions are subject to changes of one sort or another. Think how deregulation of the airlines has affected and will affect the job of the airport manager, how microprocessors have affected the entire electronics industry.

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What are some of the current issues in the field in which you are working or intend to work?

1.

2.

3.

If there are no divisive issues, what then do people in your field discuss at lunch or at professional meetings?

1.

2.

3.

If you drew a blank on these questions, do you know where you would find some of the answers? Can you name at least three professional journals that people in your field would be likely to read?

1.

2.

3.

Our respondent, Carolyn Miller, has published many articles on rhetoric and technical communication, has actively participated in many committees of ATTW and at many writing conventions, and still finds time to teach at North Carolina State University. Carolyn has also just been appointed to the CCC Editorial Board. The panel members could not have asked for a more qualified respondent.

# THE COMPOSING PROCESS IN TECHNICAL COMMUNICATION:

## RESPONSE TO THE PANEL

Carolyn R. Miller
Department of English
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I must confess that when I was asked to serve as respondent to a 4C's panel on the composing process in technical communication, I dissembled. Aloud, I said, "Sure, I'd be glad to." To myself, I said, "I wonder why anybody thinks the composing process in technical writing is different from the composing process anywhere else." It's an issue about which I have a general concern as I watch, for example, the trends of publication in the journals, the development of interest groups and program areas at meetings such as this, the pattern of administration in my own department. Is technical writing so different--and if it is, is that good or bad for it? Is it a second-class endeavor or an area of particular opportunity?

I haven't resolved these issues, but the papers I've heard here have helped me understand them somewhat more clearly. Bonny Stalnaker refers us to the familiar distinction between classroom writing and real-world stuff. I'm beginning to realize more about the import of this distinction: it represents some crucial differences between just plain composition and technical writing. It seems to me that this distinction rests on two factors, both of which are potentially significant for the kind of work these papers are discussing. The first factor is the age or experience of the writers involved--let me just call it the maturity of the writer as a writer. The second is the nature of what Jean Lutz calls the "contextualization of the rhetorical task," or that complex others call the rhetorical situation.

In classroom writing, or what some call "academic discourse," the writer is, by definition, a novice at writing, and in the typical freshman composition class he or she is usually, still, just barely an adult. In technical or professional writing, the writer plays some social role other than "student," does his or her writing by virtue of that role, and thinks of himself or herself as a functioning adult. Possibly, one way to distinguish composition and technical writing is developmentally, in terms of the experience, skills, and identity that a person acquires as he or she grows up, both socially and rhetorically. In this sense, the composing process in technical communication would be one version of a mature composing process.

The second difference has to do with what we recognize as the artificiality of the rhetorical situation in classroom writing. The professional engineers that Stalnaker is studying are immersed in rhetorical situations that press in on them with deadlines, personal ambitions, managers, and company traditions. But typically freshmen in a composition class have no very helpful sense of exigence and a reader who is not really a rhetorical audience. For this reason, they tend to produce prose that, as a recent essay in Freshman English News has argued, is largely epideictic--a reaffirmation of the teacher's knowledge and power and of the disciplinary premises the student is struggling to learn. The technical writing class seems to lie between the composition course and the professional writing situation. As Carol Hughes has suggested, the best teaching of technical writing attempts to provide for the student (or asks him or her to find) a context that simulates that of the professional. Vivienne Hertz gives some examples of how to help students learn to manage aspects of the writing process.

The question I come to is whether the classroom can be a legitimate rhetorical situation: how can it best be used in teaching an activity that ultimately must take situation or context into account? For example, can writing better be taught in a class that is not about writing--would that situation help provide more usable senses of audience and purpose? The writing-across-the-curriculum movement suggests that some people believe this is the case. How can a student best acquire a generalizable notion of context? In composition classes should we be explicitly imparting high-level rules--of genre, strategy, social roles? If so, how? Or, is the teaching of low-level rules, the kind that seem naturally to preoccupy the amateur writer, more appropriate for the composition student, since the beginner's long-term memory is not so rich a source of input for dealing with higher-level issues?

Although this session has not answered these questions for me, it has raised them and helped me to articulate them. Ultimately, the premise of this session is more sound than I first thought, for by beginning with the real stuff--with real writers and their tasks--rather than with the paradigmatic college sophomore, we are bound to learn more about the way people write and what it is we want students to achieve.

Panel F-10

Ethos in Technical Discourse:

Theory and Practice

CHAIR'S COMMENTS:

ETHOS IN TECHNICAL DISCOURSE

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The 4C's session on "Ethos in Technical Discourse: Theory and Practice," through its speakers and the audience discussion following the presentations, got into three areas not often discussed in technical writing--the application of ethics by the technical writer, the teaching of ethics in a technical writing class, and the ethics of students in technical writing classes. What follows is a summary of the points of view expressed after the papers were presented.

It was generally agreed that the technical writer should exercise an ethical point of view when developing a paper involving problems such as the environment or affecting the general quality of life, although there was a realization that the deciding factors invluencing a decision might well be out of the hands of the technical writer. There was a feeling, however, that a student writer should be encouraged to develop a viewpoint in his writing that will incorporate not only the specific criteria that may be set by the employer of the writer but also the wider values of society. It was pointed out that many government-funded projects have explicit criteria derived from ethical concerns about the environment and safety, concerns sometimes in conflict with those of private enterprise. The technical writer may well become involved in one of these conflicts because he may have to write the justification for a course of action that might be viewed by those outside his employing organization as unethical. At the very least, then, the writer should have some background in the ethical concerns of earlier times and of present concerns.

There were differing opinions as to where, and even if, such background should be given to the technical writing student. Some in the audience thought that a technical writer should be required to take philosophy or ethics courses as part of their curriculum and pointed out that such was still done in universities and colleges retaining rigorous liberal arts requirements. Others felt that, while it might not be possible to require a separate course to teach ethics, that the subject was important enough that the technical writing teacher should spend some time during the course of instruction in familiarizing the student with the concerns of ethics, since it was unsure that he would get that information elsewhere in a fairly technical curriculum. And, finally, some in the audience questioned whether one could "teach" ethics at all.

This last point led to some more careful definitions of what was meant by teaching ethics. It was agreed that one could not teach a person to be ethical; rather, one could teach a student how ethics have been formulated, defined, and applied in earlier times and at the present time. This information would then be available for use personally and professionally and should better both the writers' understanding and application. But it was pointed out that all too often students in technical writing classes, despite what the teacher may have said about ethics as a whole or the expected ethical behavior in the class itself, sometimes engage in unethical practices, the most disturbing being the plagiarism of material from other students and from published sources.

It was generally agreed that this last problem is fairly common and very difficult to solve. The teacher cannot be versed in all of the possible source material that technical writing students from many different fields will have available to them; class size and work loads usually prevent supervision so close that plagiarism is impossible; and lectures and courses on ethics cannot insure that all students will then act ethically in the classroom.

Teachers are understandably reluctant to spend time formulating methods of preventing unethical behavior or even having to explain what acceptable ethical behavior is; but it would seem from the papers presented in this session and from the following discussion that such time would certainly not be wasted. In fact, more attention to ethics should result in more capable technical writers and more pleasant technical writing classes.

THE BASIC TECHNICAL WRITING COURSE:

SKILLS AND ETHICS?

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At the 1980 CCCC technical writing sessions, Elizabeth Thebeaux delivered a paper entitled "Let's Not Ruin Technical Writing Too!" In it she argued that technical writing must try to reach three objectives: 1) to make a student aware of the relationship between good communication skills and success within an organization, 2) to familiarize the student with different kinds of writing that he or she might be expected to do in an organization, and 3) to teach the student how to use language effectively, for whatever purpose, or how "to write with clout." Her objection to the approach used by some English teachers of technical writing was their attempt to assimilate the course into the humanities curriculum. Specifically, she says: "I cannot see that our goal is to enculturate students or improve their ethical self-awareness. Our goal . . . is to prepare the student to write for the world of work."[1]

I agree with her view. This paper resulted from the question that followed her presentation. "What about Three Mile Island?," one individual wanted to know. Initially, I thought, "Well, what about it?" What became clear in the ensuing discussion was the good-hearted but sometimes wrong-headed assumptions that some of us traditionally-trained humanities types make. Yes, we and our colleagues in technical departments should be concerned with our own ethical behavior; and, yes, we should do what is reasonable to convey a sense of ethical responsibility in our students. I leave the question, "What is reasonable?," for later consideration.

My concern is to raise and attempt to answer some questions about the purpose of a basic technical writing course in an English department, the assumptions we may make about our technical faculty and students and about members of business and industry, and the proper forum for extended consideration of ethics in technological areas. Since my teaching experience in technical writing has been restricted to engineering students, my discussion must emphasize that discipline.

I have already indicated that I feel that a basic technical writing course, especially a one-semester course, should concentrate on skills. The impetus for such a course at Kansas State University came from the College of Engineering's recognition that our undergraduates were deficient in their writing ability. They want that deficiency corrected, and they have closely monitored our course to assure themselves that we are meeting their needs. To put it crassly, political reality demands that if the English department wants the significant additional head count, we had better produce a satisfactory result for them. For me and the rest of our staff that is not an ethical problem because there is great satisfaction in seeing perceptible writing improvement in our students.

When I spoke with members of our engineering faculty about the topic of this paper, I got varied reactions to the basic question. Those faculty members expressed concern about engineering ethics. Some argued that they had to discuss ethical issues in connection with their major field (especially those in nuclear engineering). One professor said he had no objection to having us require one paper on an ethical problem, but he made it clear that the engineering college had its own course in ethics. They did not need another. I then turned to the instructor for that course--a respected, outspoken, full professor near retirement. His course is a colloquium for juniors, an elective, in which members of various departments across the campus address ethical issues in engineering. While this man was far stronger than most of his colleagues in suggesting that his college was not sufficiently stressing the engineer's social responsibility, he (along with the others) felt that the English department's technical writing course was not an appropriate forum for remedying the lack of emphasis. They were consistent in urging us to do what we can do better--teach these students how to write the kinds of documents they will be expected to write on their jobs.

On the issue of our assumptions about our technical colleagues and students and about members of business and industry, I sometimes think we English teachers wrongfully adopt a holier-than-thou attitude. The reasons for those assumptions are not hard to find. There are engineering faculty and students who have narrow-minded interests and tunnel vision. For them, it seems to us, the world is a great mechanism to be fiddled with and tuned up wherever possible. Everything of importance can be solved with the right set of equations and a sufficiently powerful calculator or computer. However, we have all met the technical professional or student who has real interest in and knowledge about music, painting, drama, and/or literature. Three of the best students in my English Bible course were engineers--two students and one faculty member. In each case they were intelligent, diligent, inquisitive, responsive and, to a person, effective writers. If we ask how many of our bretheren in English can claim comparable competence and interest in mathematical, scientific, or other technical fields, I suspect we would not find very large numbers. My point is, at least in part, that we should be careful about assuming that our technical counterparts are ignorant of and insensitive to humanistic endeavors--in particular to questions of ethics.

The other part of my point concerns the attitude that many of us have probably had, at least on occasion, about business and industry people. We may assume that profit at any cost is the guiding principle. We find reinforcement for that assumption in cases more or less widely publicized. Nuclear energy is but one area. We might also consider questions of various kinds of pollution--industrial pollution of waterways, chemical waste pollution (especially in the Love Canal incident), visual pollution resulting from the strip mining of coal. There are fears about the possible consequences of genetic research and manipulation. There are engineering design flaws that cause injury and death--witness Ford Motor Company's legal battles over the Pinto's gas tank design or the crash of the DC-10 over Windsor, Ontario that resulted from a poorly designed cargo door locking mechanism. There are cases of individuals being demoted in or fired from their jobs because they "blew the whistle" on corporate or agency waste or danger to the public.

Surely, one does not condone such practices. Nonetheless, what I have called our holier-than-thou attitude may deserve further consideration. I do not consider myself isolated in an academic ivory tower, but neither am I responsible for very many risk/benefit assessments or life/death decisions. As do many of us, I would like to have affordable electrical power for my all-electric house. I do not have to decide whether that power will be generated from petroleum, coal or nuclear energy. I would also like to have a comfortable, reliable, fuel efficient, safe car that is affordable, but I do not have to decide whether an extra three hundred dollar manufacturing cost for increased safety features will put that automobile at a competitive disadvantage on the market. I would like to think that if I knew that a company for which I worked knowingly put out a product hazardous to the public safety I would blow the whistle after exhausting company channels with no positive results, but I do not have to confront the likelihood of having to penalize my family financially or the possibility of being black-balled within my profession. I can afford to take the high road, and so can most fellow academics.

What I hope comes through this series of examples is an increased awareness among us for the difficult demands put upon technical people by all of us. Many of our students and some of our colleagues from other disciplines (even humanities-oriented ones) see us as walking antiquities burrowing into such esoterica as "Chaucer's Blue Period" (as one of our former history-based associate deans described some of our research) and as being oblivious to real life, science, and technology. We, on the other hand, seem sometimes to make black and white judgments of good and bad based upon scanty information about reported unethical practices.

Another member of our engineering faculty who responded to my paper topic asked, "Is it ethical to pass judgment on a complex technical issue if one does not have all the facts pertaining to that issue?" At first, this sounds like the typical response of the technocrat trying to keep uninitiated laymen out of his area of specialization. But soon after that conversation, I read the book Divided Loyalties: Whistle-Blowing at BART (Bay Area Rapid Transit) in the Purdue University Series in Science, Technology, and Human Values. In brief, this 397 page book deals with three engineers who were fired from their jobs at BART. The ostensible reason was that they "blew the whistle" on their superiors because those superiors refused to take action against Westinghouse for faulty and unsafe design of the computer system used for controlling station stops and train braking in general. This firing eventually involved three levels of professional engineering societies and a court case. Rather than attempting to recount the voluminous details, I will quote from one paragraph of the conclusion in which the four authors decided not to leave the reader "to tease the critical ethical and pragmatic issues out of this complex narrative, to make his own judgments about right and wrong and to distribute praise and blame as he saw fit." They say:

> It would have required only a mildly selective arrangement of verifiable information to demonstrate that the Board of Directors [of BART] was a hard working, well-informed, disinterested band of dedicated citizens, committed totally to the successful completion of a project of great public interest--or that they were a group of relatively ignorant functionaries serving narrow and parochial interests, who permitted themselves to be gulled into irresponsible indolence or reckless action by unscrupulous management and self-serving employees. It would have been equally easy--and convincing--to demonstrate that the three engineers were martyrs to the cause of public safety . . . . Or, on the contrary, to show that the engineers were limited and narrow specialists, goaded by a combination of technical arrogance, overweening ambition, and naivete bordering on obtuseness to engage in acts of treachery which threatened to destroy the acknowledged and applauded *esprit* of the BART organization.[2]

This is what the authors could have done, but they did not. Reading *Divided Loyalties* pointed out to me the differences between watching or listening to three-minute broadcast news reports or reading brief newspaper or magazine accounts of such an episode and reading a detailed narrative account with accompanying documents. Reading the book illustrated that even with "all the facts" in hand and careful assimilation, organization, and analysis--it is still extremely difficult to choose the good guys in a complex situation in which unethical behavior might belong to any or all of the involved parties.

I would further suggest that we should be aware that professional engineering societies do have codes of ethics and committees on ethics or boards of ethical review. We might well familiarize ourselves with their concerns and operations. Two publications might be of interest for that information: 1) the report on the *Conference on Engineering Ethics* held on May 18-19, 1975, co-sponsored by seven engineering societies,[3] and 2) *Ethical Problems in Engineering*.[4] *Ethical Problems* . . . deals with four major areas: 1) codes and comments, 2) abstract cases in Engineering Ethics, 3) actual cases in Engineering Ethics, and 4) Engineers' Responsibilities to society: servants or guardians. Together, the three last-mentioned publications demonstrate that engineers are concerned with ethics, they have mechanisms for dealing with alleged violations of ethics, and that some of the ethical issues require a combination of extensive research, technical expertise, and an understanding of human behavior.

Thus far I have suggested directly or indirectly that technical writing teachers in English departments should concentrate on making the basic course a skills course, that engineering faculty, students, and professional engineering societies are concerned with ethical issues, and that some English teachers, well-intentioned though they are, may not have sufficient information to make ethical judgments on questions of ethics in technical areas. I would suggest that we can and should urge our students to be honest in all areas of their writing and that they be honest in their treatment of technical data. We might also structure one writing assignment to incorporate the issue of technical ethics. But I raise another question that sometimes nags me. To what extent do we feel the compulsion to concentrate on extended discussion of ethics in our own profession, among our own undergraduate majors? I cannot answer that question, but my suspicion is that we do precious little more in our own area than do our technical colleagues in theirs. If this is so, we seem to be applying a double standard.

I would like to conclude on a more positive note. If we feel strongly about the need to sensitize our students to the need for ethical behavior in a technological society, let us consider what might be a more appropriate forum for doing that. Many colleges and universities offer one or more courses in that area. The ideal context in my estimation involves a team-taught course using combinations of faculty in the sciences, engineering, philosophy, history, religious studies, and/or English. The student clientele should be fairly evenly divided between technical and humanities majors. This would allow multiple teaching perspectives and a variety of concerns, questions, and views from students. I know of one such course at Ohio University that was funded by a National Endowment for the Humanities/National Science Foundation grant. Anyone interested in existing courses of that kind should refer to the Ethics and Values in Science and Technology Resource Directory.[5]

I have not intended to suggest that teachers of basic technical writing courses in English departments are wrong to be concerned with wanting their students to be able to make responsible decisions or that other English teachers are as ill-prepared as I often feel to instruct them on how to do that. I do feel very strongly that there must be more interchange between technical and humanities areas if we are to make intelligent judgments about many of society's problems. However, I feel equally strongly that we do a disservice to ourselves, our students, and our technical colleagues if we attempt to use our course as a means toward achieving humanitarian acculturation.

## FOOTNOTES

[1] In Proceedings: 31st Conference on College Composition and Communication Sessions (Available from the Association of Teachers of Technical Writing, 1980), p. 76.

[2] Robert M. Anderson, Robert Perrucci, Dan E. Schendel, and Leon E. Trachtman (West Lafayette, Ind.: Purdue Univ. Press, 1980), pp. 339-40.

[3] (New York: American Society of Civil Engineers, n.d.).

[4] Robert J. Baum and Albert Flores, ed. (Troy, N. Y.: Rensselaer Polytechnic Institute, 1978).

[5] (Washington, D.C.: American Association for the Advancement of Science, 1978).

ETHOS, PERSONA, AND ROLE CONFUSION IN ENGINEERING:
TOWARD A PEDAGOGY FOR TECHNICAL DISCOURSE

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## INTRODUCTION

The very existence of this panel on ethos in technical communication holds special significance.[1] It provides yet another indication of a paradigmatic shift in rhetorical studies away from a Formalist model with its emphasis on the text and its attendant de-emphasis of the roles of the emitter and receiver in communication.[2] Such a truncated communication model is perfectly consistent with the tenets of its underlying epistemology, logical positivism--namely, the view that truth is embodied in an objective reality and knowledge is independent of the observer.[3] Within such an epistemology, ethos clearly has a minimal role; in the Formalist ideal, in fact, the authorial voice is absent from technical discourse.

With the discrediting of logical positivism and the subsequent emergence of a post-Formalist theory of communication, knowledge is seen as consensual, and transactional, in nature.[4] Thus knowledge is created, and not found in an objective reality. Concommitantly, there has been a discrediting of the notion of the absence of an authorial voice in technical discourse. In particular, two divergent views of ethos appear in the literature. According to one view, the long-suppressed authorial personality should now be encouraged to emerge.[5] According to the second view, the alleged absence of an authorial voice in the Formalist model is in itself seen as simply a persona--a persona conveying notions of objectivity, impersonality, and detachment--in other words, a persona denying persona.[6]

These two views of the appropriate voice in technical discourse are roughly polar and establish an ethical spectrum ranging from the very particular to the very general. Neither of these spectral extremes is seen here, in itself, as a viable view of ethos for technical discourse. The first view, advocating a personalistic ethos, is not viable chiefly because it is a vestige of the discredited logical positivism, its reappearance in a transformed version. Specifically, the personalist notion of the individual stems from logical positivism in psychology, which entails the belief that people have existences in themselves, independent of the context in general and of the observer in particular. Post-positivistic man, on the other hand, is relational in nature; his identity is a social creation rather than an ontological given.[7] In short, he is sociological, rather than psychological, in nature.

The viability of the second post-Formalist view of an ethos appropriate to technical discourse is limited because the ethos presented is overly general. We are told, for example, that <u>the</u> scientific persona in technical discourse conveys such characteristics as objectivity, impersonality, and detachment. Generally, this is the persona model used for treating ethos in the classroom.[8] But even a cursory examination of student writing confirms the enormous difficulty students have in applying this model to produce a convincing professional persona in technical discourse. Apparently, then, this notion of an idealized, universalistic persona cannot do justice to the pluralisms of aims, communities, and contexts of technical discourses. Here, we consider a pedagogical approach to persona which more directly addresses many of the students' difficulties.

We believe that the difficulties of many students originate with misconceptions of the professional role they are about to undertake. This paper is concerned with such misconceptions, with representative student problems in projecting an effective professional persona in technical discourse, and with a theoretic for a relevant pedagogy. Not surprisingly, role theory serves as the basic descriptive tool in our analysis. We focus on the role of the practicing engineer--the role engineering students will fill typically after graduating.[9] Thus, we largely exclude from direct examination the role of the engineering researcher, or of the engineering academic. We draw on our experience with a senior-level course in technical and professional communication within a college of engineering. The objective of that course is to train engineering students specialized in a variety of fields to write professional reports which are instrumentally useful for diverse audiences in large organizations.

## STUDENT MISMANAGEMENT OF PROFESSIONAL ROLES

Much of the difficulty students experience in mastering the professional engineering role stems from a reluctance to abandon the role they are long accustomed to playing, that of engineering student. For there are radical differences between the two roles--differences which lie largely in the nature of the audience, purpose and problems addressed by students and by professionals.[10] That is, students write for a single, authoritative audience--the professor--to exhibit a mastery of subject matter. They tend to treat problems which are tutorial in nature--that is, preformulated and formal, or context-impoverished, problems with predetermined solutions. Professionals, on the other hand, write for multiple, diverse audiences--some more knowledgeable than they, some less. Moreover, they write largely for instrumental rather than merely exhibitory purposes; that is, their primary goal is to accomplish something for the organization to which they belong. Unlike students, they tend to treat problems which are open-ended and ill-defined, occur in a rich context, and are amenable only to provisional solution. Consider, for example, a student and a professional reporting on the topic of transistors. A typical student report might be a term paper delineating the general properties of transistors of various types to exhibit mastery of the subject to a circuits professor--an expert on the topic. On the other hand, a typical professional report might argue that a change from one type of transistor to another type in the output stage of an audio amplifier would eliminate reported operating failures in manufactured units. In addition to technical experts, his audience would include budget, procurement, production, and customer-relations personnel. Given the enormous disparity between typical student and professional reports, as well as the student's relative inexperience with the latter, it is not surprising that a "student persona" persists in students' attempts to simulate professional discourse.

But students project not only the persona of a student in attempting to simulate professional discourse, they also project at times the persona of their professor. That they should do so is understandable: attempting to manifest the authoritativeness associated with engineering practice, and lacking direct role models, students frequently emulate the most relevant authority figure in their experiences--the technical professor. The resultant discourse manifests the authoritative ex-cathedra voice exemplified in textbooks and used to indoctrinate students in current disciplinary paradigms. Such doctrinal discourse is, however, too theoretical, reductionistic, and general to serve in professional reporting to peers, much less to superiors. Consider the following extract from a report written by a student assuming the role of an engineer working for a trucking company. His company is considering switching from the 40-foot truck trailers in use to double-bottom 27-foot truck trailers. His audience includes engineers, financial experts, and managers.

Profit Margin

Following is a study of how the profit margin of a company is determined.

A company's profit margin is related to the efficiency of its operation. The profit margin of the company will increase with a decrease in operating cost. Since the number of trips required to haul the freight is reduced with the use of the 27-ft. unit, the operating costs are reduced.

The cost per trip is constant at $80 for our company. Table 4 Daily Operating Costs, shows the daily operating costs between the trailer units.

Table 4
Daily Operating Costs

| | 40-ft unit | 27-ft unit |
|---|---|---|
| Cost ($/day) | 19,840 | 14,720 |

The daily cost of operation is found by multiplying the number of required trips by the cost per trip. The 27-ft units provide a saving of $5120 per day. Therefore, the 27-ft units will increase profits.

Note the presence of two dissonant voices in this cost-analysis section of the report--the professorial voice and a voice more appropriate for a practicing engineer. The voice heard in the beginning of the example is clearly professorial. It is this voice which expresses the initial concern for very general theoretical issues--in this case, how the "profit margin of a company" is determined. The tone is doctrinal, or tutorial; the inscribed author/reader relation is that of teacher to student. Such a tone is especially unfortunate since the primary audience formally addressed is a financial expert, the Head of the company's Finance Department, who will probably not appreciate the lecture in elementary economics. The authorial voice begins to modulate in the second paragraph with a reference to a specific company--"the company"; the modulation to a professional voice is essentially completed in the third paragraph with the reference to "our company."[11] While the writer's degree of naivete is somewhat unusual, his problem is not. Similar problems with role management are endemic in student reports.

The previous discussion dealt with manifestations in professional discourse of role mismanagement induced by the inappropriate assumption of vestigial roles from academia. But what can we say about students' direct perceptions of the profes ıal role they are about to undertake? Students generally suffer from an overly narrow conception of the role of the practicing engineer. They do not conceive the engineer as concerned with problems of organizational consequence in their full complexity; rather, they see the engineer as the mechanical implementor of preconceived solutions to narrowly defined problems. Their reports therefore show an indisposition to draw conclusions, to reach for implications; rather, they exhibit an undue preoccupation with data and procedural details. In short, students see the role of the engineer as closely akin to that of a technician.

At other times, the students' conception of the engineer's role is too broad, and their reports reveal encroachments on other professional roles--for example, those of law or medicine. In particular, their reports frequently offer judgments in areas in which engineers do not have professional expertise. An illustration might be helpful here. One of our engineering students reported simulated work for an architectural firm concerned with the following problem: The firm was in the process of designing a high-rise building when it was discovered that the planned structure would shadow a solar-energy collection system in use on an adjacent building. The job of the professional engineer would have been to determine the degree of shadowing and its engineering implications. The student, however, transgressed role boundaries in his report by extending his opinion to the legal implications of the degree of shadowing found, including an assessment that no legal liability was entailed -- all this ostensibly without recourse to legal opinion. In another case--a case where role boundaries are somewhat less distinct--an engineering student advocated adoption of a monitoring system using electrodes attached to human subjects. In his report, he made an unequivocal claim of safety for the system--a claim which encompasses an area of judgment reserved to medical expertise and hence a claim he would not be entitled to make as an engineer.

As the preceding example suggests, professional roles are not always clearly bounded, or circumscribed. Moreover, the problematic of role management deepens when roles overlap. To cite an instance based on the excerpt from a student report presented earlier: Cost considerations are of concern to both the engineer and the financial expert. But such considerations are the primary concern of the financial expert, whereas costs are only one (albeit very important) consideration for the engineer. Somehow, engineering discourse must convey the impression of exercising judgment in financial matters while showing proper deference to financial expertise. Stated in the jargon of role theory, the discourse of the engineer must evidence partial role identification without role transgression. Such skillful role manipulation is not easy for the experienced engineering practitioner, much less for the engineering student.

## EVOLUTION OF PROFESSIONAL ROLES

In the analysis thus far, we have focussed on the role of the practicing engineer as defined by the norms and conventions underlying the profession at a given moment. But obviously roles ultimately receive their informing spirit, validation, and sanction from a broader cultural context. And as the culture evolves, roles inevitably change. It is even possible, with evolution of cultural needs and norms, for the sanction of a given professional role to be withdrawn. Clearly, the synchronic perspective of our earlier discussion of the engineering role should be supplemented by a diachronic perspective. Though comprehensive treatment of the evolution of the engineer's role is clearly beyond the scope of this paper, we should note the mounting challenge to the privileging of science and technology. The reasons for the challenge are numerous, but technological fiascoes such as those involving DDT, Agent Orange, the DC-10, and the Pinto have clearly added impetus. More generally, there has been a deepening concern for the implications of many engineering developments--implications such as environmental impact, consumer abuses, and resource dissipation. The privileging of science and technology is being challenged on an epistemological level as well. With the demise mentioned earlier of the logical positivistic model underlying science and technology, they are no longer deemed privileged ways of knowing in the society at large.[12] In fact, the hegemony of science and technology in our culture may be ending.

## IMPLICATIONS

This admittedly sketchy diachronic analysis yields important implications for the role of the engineer and, ultimately, for the teacher of technical writing. In effect, the role of the engineer as traditionally conceived must be expanded as he is increasingly required not only to formulate and solve problems in a broad social context, but also to follow through by "selling" the proposed solutions in the public forum. In "selling" proposed solutions to problems, the engineer can no longer project the persona of an ex-cathedra, privileged source. The engineer's voice is now merely one among many competing, and conflicting, voices. And he will be forced to accept a reduced authority in his expanded role. He must enter an arena of competing epistemologies where reality is not a donné to which he has privileged access, but is a negotiated transaction. Admittedly, the uncontested hegemony of science and technology fostered the illusion that the engineering role has some intrinsic existence in itself. But such a hypostasization of the engineering role is, to use Michel Foucault's term, an artificial "découpage". That is, as a single discursive unit, a role ultimately cannot be detached from the great number of conditions that override and determine its belonging to the main body.[13] Role has no existential identity; it is rather, a mediated effect. We note, in passing, our own hypostasization of role which, though useful, is ultimately artificial.

The implications for the teacher of technical writing of the n-going evolution in the professional engineer's role are great. The p isional and transactional nature of professional roles must be recognized b n engineering students and their instructors. Thus, students cannot prepared simply to fill roles as conceived at a given juncture in history. They must be prepared both to adapt to evolving roles, and to participate actively in creating those roles. Students must be repared to draw on a considerable repertoire of roles in dealing with the different contexts they will face as professionals practicing in a world of competing epistemologies. As preparation for such professional role performances, students need aid in abandoning the notion of ultimate or lasting victories in favor of mediated, even compromised, resolutions. Put briefly: The engineer in the future will not always win. The importance of ethos is enormously enhanced in the new scheme of things.

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8. See, for example, Carolyn R. Miller, "A Humanistic Rationale for Technical Writing," College English, vol. 40, no. 6, Feb. 1979, pp. 610-17.

9. Our focus on students approaching graduation exploits the methodological advantage cited by Richard H. Brown in A Poetic for Sociology: Toward a Logic of Discovery for the Human Sciences (Cambridge: Cambridge University Press, 1978), p. 57: "Thus the study of persons who have just changed status or who find themselves at the interstices of conflicting roles has yielded important insights into identity management, rule construction (and evasion), social control, and institutionalization." Ironically, engineering students are predisposed to reject the concept that engineering practice involves role-playing at all. In a sense, they are willing to "be" engineers, but not to "play the role of" engineers.

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Panel F-14

New Rhetoric and Technical Writing

455

THE MACHINE IN THE CLOSET

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The belief that writing must be a central concern of every discipline i now widely held at the University of Michigan. One outcome of this belief is the recognition that students need more help understanding how to write for disciplines that are as unlike as, for instance, chemistry and art history. Studies are now underway to investigate and describe specialized language and writing tasks used in these disciplines and others.

Another outcome of the movement to teach writing across the curriculum is a realization that academic writing is very different from non-academic writing and that students can benefit from learning how to communicate with audiences other than teachers. Studies of uses of writing outside schools are being undertaken to address this issue. Research and testing of course materials for non-academic writing can help faculty incorporate composing tasks that prepare students to write for different audiences and purposes into their classes.

A number of assumptions underlying purposes for composing tasks are being re-examined. The assumption this paper questions is one that could be tested in writing courses within many disciplines: Traditionally, assignments linking expository writing and creative writing do not exist in a single course; however, a division of these two composing processes throughout a student's education as a writer may have adverse effects.

With the emergence of writing across the curriculum programs, teachers across disciplines are sharing observations about students' writing; they complain that student texts lack creative engagement with topics and that students, are, on the whole, uninspired, cliche-ridden, and dull writers. A list of teachers' complaints usually contains some or many of these items: Lack of involvement with or commitment to an idea, incorrect and uninteresting sequencing of arguments, misleading or ineffective transitional cues, stereotypical examples, inappropriate repetitions, failures to amplify or clarify. Such objections are frequently reduced to one statement: "Students can't think." Perhaps thinking is confused with representing ideas well.

Why don't students spend more time "thinking" in academic writing situations? There are some understandable causes for students' failure to present ideas interestingly. Most academic writing never requires students to present their own ideas in any <u>original</u> way--academic writing assignments are likely to resemble textbook exercises. Therefore, students rarely venture beyond conventional formulas for writing. Their audience for writing is a tester; students have no motivation to write "interestingly." Questions about reader engagement aren't relevant when the writer's purpose is to discuss something that a <u>reader already knows</u> about the subject.

A steady diet of writing solely to demonstrate performance for a more expert audience takes its toll. Teachers act bored with student writing and students leave school with the impression that they write boringly and that all composition is academic/expository and unimaginative; real world writing tasks which often require persuasion and imagination remain foreign to students.

Students who write for purposes other than demonstrating facts begin to learn about real writing situations. The best way for me to illustrate this is by referring to a seminar I teach, in which students produce videotapes to be viewed by a general audience.

At the beginning of the seminar, many of my students know little about video as a medium they could themselves communicate through, so I allow time for students to practice using the equipment which is bulky but not complicated to operate. At first the simple mechanics of video-taping absorbs our attention but within a few hours students have sufficient training to try their hands at a short personal documentary of two or three minutes duration.

Comparing cinema techniques used in these brief documentaries within the class helps students see a range of choices available to each writer/producer. After the initial tapes have been produced and discussed, each student begins planning an individual project which requires script writing. Writing, taping, acting, editing, and discussion by each class member continues for several weeks; each person has sole responsibility for all work needed to produce her or his videotape outside of class.

Students are given deadlines for stages of development they must follow during the course. Experience with beginning video writers and producers has taught me to require a five-stage schedule which includes exact deadlines. The five-stage model I use is as follows: (1) preliminary proposal to be presented to the class for comments; (2) preliminary script; (3) working script with pre-production notes; (4) actual production and editing; and (5) personal written critique of the production. An individual final critique requires students to concentrate on the total impression their production has made upon their audience.

The five stages of production have exact deadlines for completion In an eight-week period, I allow one week for the developing and writing of an idea into a proposal, two weeks for writing a preliminary script and the finishing of all pre-production plans, three weeks for a working script to be prepared and the shooting of it to be completed, and finally, two weeks for editing, applying titles, and writing the final summary. Fixed deadlines are essential and these time requirements are reasonable. Students who consistently miss deadlines have an exhausting rush at the end. Because the finished videotape is to be no more than five minutes in length, I feel comfortable requiring that all work be completed outside course meetings. Writing, rewriting, preparing to shoot, shooting, mixed sound, editing, re-editing, applying titles are ongoing through the semester, while, simultaneously, other work is proceeding in class.

Students look forward to an end-of-term showing of their videotapes for an outside audience. At Michigan I call this event the F. Stop Fitzgerald Video Festival. The development of the videotapes is essentially a creative process; however, the tapes demonstrate that the exposition of scripts and the creative presentation of ideas are complimentary considerations.

The most successful videotapes are effective because of attention to purpose and subject and audience. For example in a preliminary proposal a student named Mike stated: "Through the use of mime I am going to present a videotape which will educate children between the ages of six and twelve about some of the basic first aid techniques the Red Cross recommends." The class projects were to be for this group instructional video documents. Students became teachers via video.

At first, Mike planned to present three examples of basic first aid problems; he voluntarily reduced his lengthy preliminary script to a single instructional objective and paid careful attention to audience. In the notes accompanying his working script Mike noted: "The video, although educational, will hold the attention of the younger children because it will be on their level; the unusual interest of mime will keep older children captivated." He spent time rehearsing actors, establishing narrative flow and sequencing information before he began shooting.

Mike's final analysis of the production indicates his engagement with audience; "I failed to put in the titles of the actors and me as producer and director of the show. These were all on slides I had in my coat pocket. I cared about this error the least of all. People liked it!"

Few of the students in my course plan to write professionally for television. However, all requirements for class members are the same; students combine creativity and expository writing; in fact, most of the students write and re-write their scripts many more times than I require. Their motivation to capture and hold their audience's attention is very great. Many students say that this is the first time they experienced strong responses to their writing. Sometimes that response surprised them, and they cared a great deal about communicating.

My point is, finally, that students were writing with more care than they ever had before because the fullest range of creative and expository talents were expected of them and because they became aware of real audiences for their efforts.

# SOME APPLICATIONS OF THE NEW RHETORIC TO THE TEACHING OF TECHNICAL WRITING: AN ALTERNATIVE TO THE PRODUCT MODEL

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Kenneth Burke, in his Rhetoric of Motives, says that any way of living and thinking is reducible to terms of an idea:

> an idea that will be "creative" in the sense that anyone who grasps it will embody it or represent it in any mode of action he may choose. The idea, or underlying principle, must be approached by him through the sensory images of his cultural scene. But until he intuitively grasps the principle of such an imaginal clutter, he cannot be profoundly creative, so far as the genius of that "idea" is concerned. For to be profoundly representative of a culture, he will not imitate its mere insignia, but the principle behind the ordering of those insignia. (p. 137)

I begin with this particular passage because it suggests to me a way of talking about a long-standing argument against prescriptive approaches to the teaching of technical writing. When we teach the conventions of technical discourse, we are, in Burke's terms, teaching our students the insignia of a way of living and thinking: a language agreed upon by a community of professionals for a specific purpose. But, as the argument would continue, if we want our students to be "profoundly creative" representatives of that community, we have to do more than teach them to merely imitate those conventions. We have to invite them to look for and use the generating principles behind the conventions as well. For those of us who teach technical writing, that means teaching our students not just to identify and imitate the products of technical discourse, but to help them grasp those principles which will allow them to "act" rhetorically.

Given this argument, many teachers, dissatisfied with the product model's emphasis on a prescriptive approach to writing, have looked to pedagogical applications of recent rhetorical theory to provide a different kind of advice, one which offers heuristics instead of rules. And so, Burke's pentad has been used to analyze rhetorical situations and articles in professional journals. Young, Becker, and Pike's grid has been used to analyze a mechanism by viewing it as a particle, wave, or field. And problem-solving strategies devised by

Larson or by Flower and Hayes have been offered as ways to define problems for feasibility reports and proposals. By giving students a systematic and yet non-prescriptive way of analyzing material, problems to be solved, or audiences to be addressed, such techniques suggest a way to help students break away from the mere imitation of "insignia." By reintroducing the art of invention into technical writing, heuristics seem to be one way to help students grasp the rhetorical principles behind the products they create.

But as appealing as the concept of heuristics is, I have never been able to apply them in the ways I've described without feeling I still have not addressed one of my central concerns about teaching the conventions of technical discourse. Whether I present technical writing as either a matter of following the rules for the production of a well-made artifact or as a heuristically-enabled process of problem-solving, such advice does not always help my students recognize the importance of language itself. Using Young, Becker, and Pike's grid can help my students recover a great deal of information about their subject, but the focus of their investigation is still on the thing or problem "out there" they are trying to analyze. When they are through with their analysis, they have yet to work with the language they will use to write about that thing or problem. And the language students choose to use will finally transform the thing invention seeks to discover, whether they are writing something as overtly persuasive as a proposal or as studiedly objective as a technical report.

The way in which language transforms material is often slighted in textbook treatments of language as well. As Carolyn Miller has argued, the typical textbook implies a traditional "window pane theory of language," the notion of the ideal technical language as essentially a non-interfering vehicle for the presentation of the facts (ref. 1). Such a view, she argues, is inconsistent with a new epistemology held by most philosophers of science--and, I would add, by many critics and rhetoricians such as I. A. Richards and Kenneth Burke--that see material reality as mediated by our symbolic representations of it. Facts and the theories based on them, then, are seen as essentially human constructs made of symbols--language in its broadest sense.

On the basis of this way of knowing, all technical and scientific discourse is fundamentally rhetorical; as Michael Halloran has argued as well:

> What the scientist concerns himself with is not so much things as symbols, and there are thus alternative scientific accountings for a given slice of reality. The test of a given scientific schema is as much the degree to which it wins the agreement of scientists as the degree to which it coincides with physical reality. (ref. 2)

For me, however, the point is not whether the writers of technical writing textbooks deny this particular rhetorical view of language. Rather, what concerns me is that their usual way of talking about language does not seem to help students to see that clarity, objectivity, and impersonality are conventions of a particular kind of discourse--conventions chosen for and occasionally altered by the particular needs and purposes of human beings in a given rhetorical situation. The problem of this way of talking is that students--or mine at least--misunderstand such advice to mean that language is unimportant--at best a simple matter of lexical or syntactical manipulation designed only to allow their various readers a clearer view of the facts. They miss the idea behind the insignia: that the conventions serve a rhetorical purpose.

What I am suggesting here is not that the advice given by textbooks is wrong or that we should throw out the concept of heuristics. Nor do I want to suggest that the facts themselves are not crucial to good technical writing. Instead, I would argue that if we want to apply rhetorical theory to the teaching of technical writing, then we could begin by broadening the principle of heuristics to include one of the most potentially powerful concepts some of that theory has to offer: language itself as a way of knowing. It is this view of language Susanne Langer invokes when she says:

> In a sense, language is conception, and conception is the frame of perception; or, as Sapir has put it, "Language is heuristic...in that its forms predetermine for us certain modes of observation and interpretation...." The fact is that our primary world of reality is a verbal one. (Philosophy in a New Key, pp. 125-126)

For students, the potential power of such a concept lies in its ability to suggest to them, through the way we apply it, that the reports and articles they write are, finally, a kind of self-expression, a way to define a self as a professional member of a language community. Without this awareness, few students seem able to find much of value in the activity of writing.

Last year, in my introductory course in technical writing, I received a student proposal requesting permission to do a feasibility study on the prospects of opening an arcade in the campus area. Under a heading labeled "Qualifications and Scope," the student had written a sentence which captures the tone of the proposal in general: "Being a self-proclaimed connoisseur of pinball, I can appreciate the usefulness of the game." Another student began her proposal to continue research on the licensing of translators with the following sentence: "It is noteworthy that terminology largely accounts for the development of national languages in the recent period, in particular the expansion of their lexical composition."

One way of describing what is wrong with these sentences is to say that, given their particular contexts, the first is not objective or impersonal enough and the second is not clear. I could also say each indicates the writer's failure to analyze audience carefully enough beforehand. Perhaps. But the problem of rhetorical stance in both cases is one which I would argue can be addressed as well by focusing on how their language choice has transformed their original purpose: to convince the reader not only that a problem exists, but that they have the authority to solve it as well.

In these particular proposals, the pinball "connoisseur" sees authority as essentially a matter of asserting it exists and in a language that, in its idiosyncratic expression, actually denies the professional authority it claims to assert. In choosing such language, the writer creates an unbelievable audience as well, one which respects assertions without proof and is charmed by naiveté. The second writer seeks her authority in the opposite direction, by effacing herself completely and speaking in the voice of the institution, the jargon of the professional translator. In doing so, she implies an audience of insiders or, even more unlikely, a lay audience easily impressed by technical display.

The purpose behind using a focus on language for such problems would not be to impart rules or provide more devices for analyzing data. Nor would it be to teach theory itself. Instead, the goal would be to help students learn to see their language objectively and to see that there are optional ways of naming and presenting their factual material, material they tend to assume "presents itself." Such an approach is not easy since seeing language in this way is an ability that apparently had to develop; it is an ability few of my students have been able to learn by memorizing rules about audience and style.

Consequently, a focus on language as heuristic would place a great deal of emphasis on reading and discussing student work in class. For students to begin to locate themselves between purely idiosyncratic and purely institutional rhetorical choices, they must hear the voices other students have adopted. And to see that the language they use will limit how much they and their readers can finally know about their material, they need to see optional ways of defining problems and organizing them through language. Thus, a report or even a description of a mechanism could be approached in terms of the individual rhetoric the student has adopted and then compared to the choices made by others in his or her class, operating under similar constraints of audience, form, and purpose. Each piece of writing could be discussed, finally, as one possible way of constructing the rhetorical situation, an act of interpretation among several; some inevitably more effective than others, but none which is The Answer, The Way to address the problem. Writing, using this approach, would necessarily become more an exploratory act than the reproduction of a model.

We can use such an approach to help teach invention, then, by having students write exploratory drafts of their material and critique what the language implies until they can reach more effective formulations. By focusing on their language, students can begin to see how defining a rhetorical problem in a certain language can force them into limited conceptions of their material and stereotyped views of themselves and their audience. (A problem we see, for example, when students try to write instructions for a general audience by turning the readers into cartoon characters with low I.Q.'s.) For the pinball connoisseur and the language translator, I would begin, then, by asking them what it meant, given the context of their proposals, to talk the way they did. By discovering the implications such language choices have for their audiences and the authority the writers are seeking, both can begin to turn against their respective idiosyncratic and institutional choices to locate themselves between the two until they can create a stance which will sacrifice neither the personal nor the professional.

We can approach arrangement by getting students to see headings and the forms themselves as verbal reflections of their own thought in process, not as empty slots to be filled--a problem encouraged, I think, by asking students to do all their thinking prior to writing itself. Instead, we could invite students to see language as something which helps us to reason by allowing us to arrange things spatially. By writing first and then using the forms to adjust what they have written, students may begin to break out of the mindless use of outlines. Applying headings and subheadings at a secondary stage can help them to see how form can place restraints on what they have written, but also how what they have written can, in part, determine the form.

Finally, we can teach style, not as a matter of just presenting the material as clearly, objectively, and impersonally as possible, but as a larger rhetorical concept: style as I have been describing it here--as an act of self-expression within the constraints of a particular language community. Thus, student texts can be read not simply as vehicles for transferring information, but, in Burke's terms, as personal "acts upon a scene," acts which require different language choices because they occur in different rhetorical situations.

I realize that in describing such an approach I have not given you much in the way of "how to." Much of this paper has grown out of a personal need to find a new theoretical basis for my own course. But as I think now about what I might do for assignments next semester, I turn automatically to ways of complicating handbook advice about technical and professional writing. I may ask my students to write two letters of application for jobs of their choice, one using textbook form and correct grammar, but using the phony language we all know as letterese. Then I might have them do another version, this time using the language of an ideal self they would like to present to an employer. Finally, I would ask them to write a third piece in which they define, on the basis of what they have written, what they understand good professional writing to be. Later on, I might have them write two process analyses, one for a journal read by professionals in their field and one for a manual written for laymen. Following that work, I might ask them, also on the basis of what they have written, to define again the nature of good professional writing, now in light of the constraints of different rhetorical situations.

But such assignments are only one teacher's way of approaching a concept the power of which resides in its ability to take many forms. Instead, I would argue, rather, for the value of a principle--an idea behind the insignia of personal teaching technique. That idea is based on the initial assumption that authority in technical writing comes as much from the language the writer chooses to use as it does from his facts. While helpful, perhaps, before writing, heuristics as they are generally used seem to place that authority outside the realm of language altogether and place it in the device itself. And the product model strips that authority of its essentially rhetorical nature.

So I'm led to a second assumption: that one way of teaching students to develop authority in their writing is to help them develop a critical method, a method which, in the social context of the classroom, allows them to evaluate their own language choices. Teaching such a method may not be, finally, a matter of "giving advice" at all, but rather a matter of demonstration. If that is the case, then perhaps one of the best ways a teacher can apply the new rhetoric is by enacting a rhetorical method of inquiry into language use and by posing writing tasks that will invite the student to do the same. By focusing on how each student has chosen to create his subject, his image of himself, and his audience, and by considering alternative formulations in language, we would be teaching our students the insignia of the cultural scene, the conventions of a language community. But we would also be giving them a method of grasping the principle behind such insignia: that technical language is not just a matter of imitating those conventions, but a way of coming to create and know a professional self.

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146

# TECHNICAL COMMUNICATION: MEETING THE NEEDS OF ADULT WRITERS

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During the past year, I have noticed a recurrent ad that appears in The Wall Street Journal announcing a two-day technical writing workshop for professionals in business and technology. The ad invites "those who must communicate technical information" to attend the sessions. I am sure this expensive, tax deductible workshop draws participants from corporate headquarters and research laboratories: people acutely aware that their professional advancement depends on their ability to communicate effectively. This brief workshop moves from city to city promising to increase awareness of what distinguishes good technical writing and to show how to achieve it. The ad implies that personal fulfillment, greater job staisfaction, and even job security can be attained through the course.

Despite the advertising hyperbole, the ad focuses attention on the real need for effective communication in the fields of business and technology. This traveling workshop as well as similar university extension classes and in-house educational programs exist because of the growing realization that communication training enhances every professional's performance. These courses are responses to the on-the-job need for improved communication skills. Although the inability to prepare effective correspondence, proposals, and reports does not always preclude communication, it does undermine productivity. During our current economic uncertainties, this can be a costly handicap. The continuing ad in The Wall Street Journal affirms the fact that many people outside the university realize this and want to improve their writing skills.

## NEED FOR EFFECTIVE COMMUNICATION

This recognition of the need for effective communication is also reflected on campuses across the country in the increased demand for business and technical communication courses and the subsequent proliferation of these classes. Students may perceive what Andrews and Koester document in a recent survey (1979) to determine the professional shortcomings of entry-level accountants in C.P.A. firms, corporations, and government agencies.[1] Supervisors identified nonnumerical report writing as the most significant problem area. Asking the membership of most professional societies to describe the deficiencies of college graduates recently hired would elicit responses similar to that reported in the Andrews/Koester study.

Employer feedback as well as classroom experiences have alerted colleagues in the colleges of business, science, and engineering to the need for students to have more extensive training in written communication than received in basic composition courses. Many of these faculty members encourage the development of business and technical communication programs that meet the practical needs of career-oriented students. In addition, these upper division courses help demonstrate a department's and an institution's concern that their graduates develop proficiency in writing. This visible and verifiable commitment to improving communication skills aids is dispelling the public fear that college graduates may be unable to express themselves effectively.

Besides being popular among upperclassmen, these courses also have the potential to attract men and women from off campus who, like their counterparts attending a brief training workshop, seek to develop and refine their job skills. The expectations of this complex adult audience preclude technical communication courses from becoming revamped, intensified versions of freshman composition or having a remedial focus. The maturity of the clientele for these courses must be reflected in their intent and their design if they are to succeed. In this learning situation, the traditional methods of teaching adolescents how to write become inappropriate. More than years separate the adult writer from the adolescent writer. Experience sharpens both an individual's perspective of himself and his needs.

## THE ADULT WRITER

Consultants who specialize in communication training for professionals in business and technology recognize the adult's heightened awareness and impatience when designing their workshops. Because their success depends on their ability to appeal to an audience, these instructors must quickly and consistently show workshop participants how the presented information is relevant for their successful job performance. Initially they do this by assiduously striving to give their short courses the appearance of being more than rehashes of business English and composition classes. Perhaps the continuing popularity of Rudolf Flesch's self-help book <u>The Art of Readable Writing</u>, and the communication workships it spawned, stems from his belief that people realize the formal rhetorical training received during adolescence is inadequate for the demands of professional life. He attributes his audience's aversion to writing to uncertainty about how to create persuasive and meaningful prose.

This confusion breeds frustration and anxiety, emotions that can undermine self-confidence. In order to increase the adult's sense of rhetorical control and subsequently his confidence, Flesch minimizes the difficulties inherent in communicating effectively. Unfortunately, this attempt at reeducation increases confidence by making the task of writing efficiently look deceptively easy. Flesch's advice may even instill unwarranted self-confidence. By advising his inexperienced audience to "learn to write the way you talk... and unlearn the rules you were taught in school,"[2] he attempts to make them feel unrestrained. However, technical communication, like all disciplines, requires self-restraint.

Flesch's directions are appealing because they sound easy, look like fun, and require little concentration. <u>The Art of Readable Writing</u>, like the literature advertising technical communication workshops, implies that the barriers preventing writers from successfully expressing themselves are the misinformation learned and inapplicable advice received in composition courses. People who accept these assumptions may achieve a personally satisfying form of self-expression, but seldom will they achieve effective communication.

Transcription of speech, except when used to recreate dialogue, never sounds natural on paper. Naturalness, that aesthetically pleasing sonic quality, demands that we choose our words more carefully than we do in conversation. Its presence may pass undetected, but its absence is always noticed. Aristotle emphasizes in The Rhetoric that "naturalness is persuasive, artificiality is the contrary."[3] This important quality contributes to the overall effect that skilled writers strive to achieve.

Of course disregarding rules learned in school may be emotionally satisfying, but most are conventions. Few writers with professional responsibilities can ignore these rules of the game. These men and women have neither the rhetorical knowledge that would allow them to disregard rules selectively nor the skill that would allow them to compensate effectively. Those who fail to conform to the conventions of grammar, spelling, and organization risk drawing attention away from the presented information. Instead, the focus may shift to the inadequacies of the presentation, seriously undermining credibility.

## A UNIQUE FORM OF COMMUNICATION

Despite Rudolph Flesch'e assertions, writing done by professionals in business and technology is a uniquely difficult form of communication that demands conformity to conventions and simultaneoulsy encourages individuality. Imagination rather than blind compliance distinguishes effective correspondance, proposals, and reports. This fact becomes apparent to anyone who attempts to teach the discipline of technical communication conscientiously or to master it. No formulas exist that guarantee the success of either effort. Both require understanding of the communication process and skill.

Writing must be learned: people are not born with this facility. Although colleagues in all disciplines encourage efforts to develop this skill, many mistakenly assume that every member of a faculty possesses an innate ability to teach effective communication. A recent article in the Chronical of Higher Education helps demonstrate the pervasiveness of this myth. This report summarizes the American Association of Higher Education's project to determine the retraining needs of mid-career faculty whose disciplines experience declining enrollments. Listen to the project director describe a hypothetical but possible retraining scenario. "If history enrollments are declining and the college needs teachers for technical writing, the administration may develop a seminar and ask faculty members if they are willing to teach classes...."[4]

Let's alter this scenario slightly. If the demand for American history or even Shakespeare began to grow rapidly and significantly, would anyone suggest offering colleagues from other disciplines a seminar so that they could teach the overflow? I am sure that history and English departments and the clienteles they serve would want instructors to have more than cursory knowledge of what they teach. Cosmetic retraining seldom creates an effective teacher. The implication that it provides adequate preparation for teaching technical communication reveals a common but inaccurate perception of this complex discipline.

Through their promotional literature, consultants specializing in communication training, and even educators who retrain faculty, may inadvertently contribute to this misconception. Ubiquitous ads emphasize the ease with which technical communication can be mastered. Despite this claim, a brief seminar or workshop can only provide an informative overview of the craft--no more than a superficial introduction. Short course participants, like The Art of Readable Writing's readers, may receive assurances that the challenges of the discipline can be successfully met, but increased confidence without a corresponding increase in the comprehension of the principles that underlie effective communication does not improve skill. This understanding must be shared by those who want to create successful communication and those who want to help others learn to do it.

Professionals in business and technology must know how to do more than merely use language correctly: they must learn to use it effectively. Correspondence, proposals, and reports are more than error-free forms of self-expression. Each must be designed for a specific purpose and audience. Mature writers have the demanding responsibility of being both architect and builder. They devise a plan and carry it through. Rhetorical training that oversimplifies the writing process for these adults does them a disservice. They must realize than any successful form of expression requires forethought and complete concentration, a stressful combination. Rarely is writing a relaxing experience, unless done solely for personal entertainment.

## THE CHALLENGE

The psychologist Masanao Toda succinctly defines the difficult challenge shared by adult writers in his description of communication as "a mixed process of control and observation. From the viewpoint of the sender, the sender is transmitting information for the purpose of controlling the state of the mind of the receiver. From the viewpoint of the receiver, the receiver is receiving information for the purpose of correctly representing the state of mind of the sender."[5] Skilled writers transmit information, but, in addition, they also strive to create an impression. These senders, or communicators, control the receiver's perception of their minds. All communication efforts can affect either positively or negatively an audience's response to the message and the sender. Achieving the control necessary to elicit the desired positive reaction requires self-discipline, an attribute not easily developed.

The emphasis on the conscious presentation of persona, or public self, distinguishes courses in technical communication from traditional undergraduate composition classes. Although the creation of any meaningful form of written communication is an act requiring solitude, the end products of technical communication, correspondence, proposals, and reports, become public. Professionals in business and technology and those preparing for careers in these areas quickly recognize this fact and see their work as a reflection of themselves. The writer's public self stems from the authorial presence, an image conveyed through an organizational strategy, diction, and syntax.

Ignoring this realistic need to present the self deprives adult writers of the opportunity to develop the rhetorical skills that will permit them to perform successfully in their professional lives. These men and women, unlike adolescents learning to write, do not discover their subject, their ideas, or even themselves as they write. The process of discovery occurs through the gathering and analysis of data. For these adults writing is a process of efficiently presenting their information and themselves in a pleasing and professional manner. They design their work to accomplish a specific task and satisfy an actual audience. Achieving these goals requires the ability to analyze and adapt to audience.

Sociologist Arnold Larson's description of language's versatility illuminates the importance of adaptation in technical communication: "In our society we speak as we live--according to our roles. Our roles are many, and the ways we use speech are as numerous...And each of these roles requires a different use of language is the role player is with it."[6] Being "with it" means having the ability to adapt to changing situations. In writing this is impossible unless the writer understands language's pliable role in communication and can use it imaginatively. These are the goals of the effective technical communication course. They are achieved only through arduous student effort and a knowledgeable instructor's feedback.

Technical communication shifts the writer's attention from himself to his audience. His task is to solve the rhetorical problem of effectively presenting both his information and himself. In addition, this challenge provides insights into the complexity of the communication process. This expansion of perspective helps clarify the fact that meaningful expression is a conscious act, requiring forethought and skill. This increased understanding permits adult writers to begin realistically assessing the difficulties inherent in the writing process and to recognize their sole responsibility for its results.

Rhetorical development, like emotional growth, is impossible without the ability to confront, to interpret, and to evaluate the needs of each situation as it arises. Despite claims to the contrary, these are difficult steps to master and to teach.

Technical communication is more than simply reporting factual information. Failure to recognize this is a disservice to those who seek to learn the craft and those who teach them.

ENDNOTES

[1]J. Douglas Andrews and Robert J. Koester, "Communication Difficulties As Perceived By The Accounting Profession and Professors of Accounting," The Journal of Business Communication, 16, No. 2 (Winter 1979), 33-42.

[2]Rudolf Flesch, The Art of Readable Writing (New York: Harper and Row Publishers, 1974), p. 210.

[3]Aristotle, "On Prose Style," in The Problem of Style, ed. J. V. Cummingham (New York: Fawcett Publications, 1966), p. 70.

[4]"Few Colleges Found to Offer Career Planning for Professors," Chronicle of Higher Education, March 9, 1981, p. 6, cols. 1-5.

[5]Masanao Toda, "About the Notions of Communication and Structure: A Perspective" in Communication: Concepts and Perspectives, ed. Lee Thayer (Washington D.C.: Spartan Books, 1967), p. 41.

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152

# Applying Selected New Rhetorical Strategies to Teaching Professional and Technical Writing

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The New Rhetoric of the last ten years has produced a number of concepts which were intended primarily for the introductory composition classroom. While we may assume that these ideas are applicable at all levels of composition, teachers of technical and professional writing* have generally not been as enthusiastic about these recent developments as other teachers of composition. Th reason, I think, is that professional writing teachers are not convinced that the new rherorical strategies are particularly relevant to their pedagogical aims. In this paper I wish to make the case that some of these new strategies can indeed be modified to achieve the very specific aims of the professional writing instructor. Two of these, which I treat in this paper, are Sentence Combining and Heuristic Schemes of Invention.

As we know from the work of Hunt, Mellon, O'Hare and many others, sentence combining has helped inexperienced writers achieve more mature and complex prose than they might have in more traditional forms of instruction. But we do not usually think of sentence combining as a technique appropriate for more advanced and experienced students like those who usually take professional writing courses. In addition the aims of a number of sentence combining advocates--complexity and maturity measured by sentence and clause length--do not seem to be the criteria which most professional writing teachers hold up for imitation.

But if we replace these somewhat vague aims of general sentence combining with more sharply focused goals appropriate for professional writing classes, we find that sentence combining can be a very helpful technique indeed. The goals are fairly clear and unambiguous. Since the aim of professional writing is to communicate information in a straightforward manner as quickly and as efficiently as possible, the goals of sentence combining in the professional writing context are to help students learn to write highly readable sentences densely packed with information. The length and complexity of these may vary, but in any case these sentences will have a high readability index as measured by readability theorists, and they will contain a high ratio of information to number of words, however that is measured.

*From this point on, I will use the term professional writing to refer to the kinds of writing done in business, technical and professional areas.

Let me examine the meaning of readability and high information density before suggesting some ways of designing sentence combining exercises to achieve these profession writing goals.

High information density is a function of sentence structure as well as semantic specificity and concretion. Short sentences are not usually the most efficient because they necessitate redundancy of a needless sort. As everyone knows, sentence combining makes it possible to eliminate words and retain meaning without any loss. On the surface at least, sentence combining automatically tends to produce higher density of information. So by its very nature, it would seem, sentence combining can result in higher information density. And thus necessarily it would seem to achieve the aims of professional writing instruction. But there is another factor to be considered. High information density by itself is not enough to insure good professional writing. Tension has to be maintained between the information density in a sentence and the readability of the structure of a sentence. In other words, one can pack bits of information into a sentence effectively if the sentence is easily comprehensible because of its structure. High information density must be combined with easily readable sentence structure.

Readability can be defined in at least two ways. The first definition comes from reading theorists such as Flesch, Gunning, Klare and others. Second there is what I call readability of the marketplace, readability standards established in those publications which compete for a large readership on the basis of accuracy and efficiency of information. Research journals, stock advisories, financial reports, technical publications, technical analyses and reports, etc. depend not only on accuracy but efficiency in a world where reading time is at a premium. In these terms, wide readership means high readability. De facto the sentence patterning and other stylistic qualities in these publications furnish models for imitation because they work in the marketplace.

Both kinds of readability can form bases for sentence combining exercises. The logic is this: if readability measurements can tell us which syntactical patterns are more readable than others, then we can devise sentence combining exercises which will help students produce highly readable sentence patterns and combinations of patterns.

First, let us examine the information which comes from traditional readability research. Even though readability formulae are mathematically precise, there is not absolute agreement about their meaning. Nonetheless there is sufficient consensus among theorists so that we can evaluate some sentence patterns as more readable than others. These sentence patterns can be identified by collating the conclusions of a number of reading theorists, linguists, and well-regarded, well-read writers of composition texts.

Syntactically the two most important readability factors are sentence length and sentence pattern. The reading formulae of Gunning, Flesch, and

Klare assert that longer sentences are harder to read than short ones, and that there is a sentence length appropriate for the reading skill of a particular audience (Klare, 1977). Houp and Pearsall, in their popular Technical Report Writing, venture that there is an average sentence length which technical writers as a general norm should aim for (Houp and Pearsall, 1980). Walker Gibson, in Tough, Sweet and Stuffy, (1966) feels that clause length is also important. He suggests that subordinate clause length should not exceed ten words and that the proportionate length of subordinate clauses should not be more than a third of the total sentence length. Houp and Pearsall (1980) cite Francis Christensen's valuable but limited early research which found that 95% of the sentences sampled followed either the pattern Subject Verb Object (Complement) or Short Adverbal plus Subject Verb Object (Complement). Further, he found that the pattern SVO(C) without initial modifier occurred with about 75% frequency. Of the sentences counted, about 23% contained a short left-branch or initial or prepositional phrases. Left-branch modifiers occur before the subject; right-branch after the object or complement. The left-branch infinitive or participial phrase occurred only 1.2% of the time. The subject of the sentences sampled was delayed until after the verb in only 3% of the cases. This early research established the idea that patterns could indeed be observed in easily comprehensible prose and that the patterns are probably a factor in the readability of that prose.

More recently psycholinguists have verified that left-branched complex sentences are more difficult to remember than right-branched complex sentences (Clark and Clark, 1968). Embedding a clause at the beginning or in the middle of a sentence makes that sentence harder to understand than placing the clause in the right branch position (Miller and Isard, 1964; Schwartz, Sparkman, and Deese, 1970).

Embedded element at beginning:
That we are prepared is something he knows.

Embedded element in right branch position:
He knows that we are prepared.

Embedded element centrally placed:
The equipment, meeting all strict specifications of the engineers, performed very well.

Embedded element in right branch position:
The equipment performed well, meeting all strict specifications of the engineers.

While single center-of-the-sentence embedding of clauses can be fairly easily handled by the reader, readability drops dramatically with additional center embeddings (Larkin and Burns, 1970).

Briefly other findings are that negative sentences are less comprehensible than positive versions (Wason, 1961). Relative clauses are easier to understand when the relative pronoun is not deleted (Hakes and Cairns, 1970). The active voice is easier to comprehend than the passive voice (Klare, 1977). Sentences with nominalizations in the subject position are more difficult to process cognitively than sentences with subjects which are the agents of the action of the verb (Coleman, 1954; Williams, 1979).

From this brief look at readability research, we can pull together a number of generalizations which can suggest ideas for creating sentence combining exercises for professional writers.

The basic sentence pattern that can be used most of the time can be represented schematically as follows:

| LB | S | V | O | (C) | RB |
|---|---|---|---|---|---|
| frequent adverbial modification | | | | | phrasal and clausal modification placed here more often than in other positions. |

Central embedding should be kept to single embedding. Active affirmative sentences should be chosen over passive or negative forms. To look at this pattern another way, predication should be kept straightforward, relatively short, and the added commentary or qualifying information should be put in the right-branch position as frequently as possible. (If this conclusion seems prescriptive, to be writing by number, so to speak, it is good to recall that one of the great stylistic achievements of the Renaissance was the variety achieved within the fixed sonnet form.)

If we can, as I have suggested, define readability, especially syntactic readability, in terms of stylistic features, then logically the next step is to use that information to design sentence combining exercises which will help professional writing students produce highly readable, efficient sentences high in information density. The purpose of this paper is, however, not to produce those exercises but to suggest how that might be done.

First of all, to achieve high information density, sentences have to be combined to reduce the total number of words and at the same time the combined sentences have to follow the patterns I have generalized in previous paragraphs. Students can first be taught to economize words by using such combining strategies as the relative clause, participial and infinitive phrases, appositives and absolutes. Then exercises could call for percentages and types of combinations in various positions of the sentence, right and left-branch, single central embedding can be called for. We could imagine, for instance an exercise calling for a mixture of left-branch adverbial modification in twenty percent of the sentences, right-branch relative clause modification in forty percent of the sentences, and participial right-branch modification in thirty percent of the sentences. The instructions could be as specific as the teacher considers appropriate, or they can be approximate such as this:

> "Combine the following kernals into a passage in which there are no more than five left-branch modifiers of more than five words each. Try to achieve a heavy proportion of right-branch modification, using any of the four combining strategies which we have practiced."

At this point, one might be asking: Where do the short kernal sentences in the exercises come from? Presently there is no sentence combining text for professional writers.* Until such time as a text appears, instructors will have to brush up their transformational grammar skills, examine the current sentence combining texts, and create the exercises themselves.

Let me get back to the kinds of exercises that can be devised. Students can be asked to combine kernals in a variety of ways and to compare the relative readability of left-branch and right-branch modification; to similarly compare the readability of single central embedding with that of multiple embedding; to compare phrasal modification to clausal, and so forth.

Additionally, kernals with nominalizations could be rewritten in combinations so that the nominalizations are detransformed into the structures they originally came from. Abstract words in the kernals could be replaced with more concrete words. Passive constructions in the kernals could be changed into active ones.

These are exercises based upon traditional readability criteria. But I have suggested another kind, readability of the marketplace. It too can provide a basis for sentence combining exercises. Marketplace readability assumes that the most readable sentence patterning is found in widely read publications which vie for an audience in the marketplace of readers. How can we determine what this sentence patterning is and how can we get students to imitate it?

The answer is provided by a technique of stylistic analysis which has been created by Patrick Hartwell, Professor of English at Indiana University of Pennsylvania. Basically Hartwell's method begins with a stylistic worksheet which identifies key features that define a particular style. It does this in quantitative terms, in numbers and percentages. Once the student has used the sheet to get a stylistic fix on the writing he/she wishes to imitate, the next step is to replicate the numbers and percentages in his/her own writing. The duplicated features will result in the same kind of readability as found in the original, assuming that the student's writing has the same semantic readability as the original.

*Colleagues of mine--Richard Ray, Gary Olson--and I are working on such a text which we hope to complete by 1982.

## HARTWELL STYLE WORKSHEET

SENTENCE

1. Number of words ______
2. Number of Sentences ______
   3. Words per Sentence (1 ÷ 2) ______%
4. Number of T-Units ______
   5. Words per T-Unit (1 ÷ 4) ______%
   6. T-Units per Sentence (4 ÷ 2) ______%

PREDICATION

7. Number of Finite Verbs ______
8. Number Agent Subjects ______
   9. % Agent Subjects (8 ÷ 7) ______
10. Number of to be as Main Verb (am, are, is, was, were) ______
11. % to be as Main Verb (10 ÷ 7) ______%

DICTION

12. Number of Polysyllabic Words ______
    13. % Polysyllabic Words (12 ÷ 1) ______%

MODIFICATION

14. Number of Words in Free Modification ______
    15. % of Words in Free Modification (14 ÷ 1) ______%
16. Number of LB Free Modifiers ______
17. Words in LB Free Modification ______
    18. Avg. Length of LB Free Modifiers (17 ÷ 16) ______
19. Number of Embedded Free Modifiers ______
20. Words in Embedded Free Modifiers ______
    21. Avg. Length of Embedded Free Modifiers (20 ÷ 19) ______
22. Number of RB Free Modifiers ______
23. Words in RB Free Modification ______
    24. Avg. Length of RB Free Modifiers (23 ÷ 22) ______

Stylistic features can be added to or deleted from the sheet to fit the needs of the students using it, and to help the instructor focus directly on whatever he/she wants to emphasize.

At this point we need to see the connection between the stylistic worksheet and sentence combining exercises. The worksheet pinpoints the features which produce readability in the models which we have chosen. With that quantitative information as a base, we can then devise sentence combining exercises to help students imitate the original, and produce the kinds of readable sentences in the original. In other words, the instructor begins with a piece of widely-read and well-regarded writing--the kind found in Fortune, Science, The Wall Street Journal, The Scientific American--analyzes it using a stylistic instrument, then devises sentence combining exercises to produce features found in the original. One of the advantages of this system is that if there are stylistic differences which distinguish one type of professional writing from another, then the style sheet allows the instructor to devise sentence combining exercises which will help the student imitate the distinguishing features of the original.

On the basis of the style sheet, the instructor can design exercises that call for sentences of a certain average length; students can be directed to produce a certain percentage of agent subjects, a certain percentage of words in free modification, a certain percentage of right and left branch modifiers, and so on, using any and all of the features on the sheet as guides for sentence combining exercises.

Sentence combining, then, can be a very specific and useful tool for professional writing teachers if it can be targeted to produce qualities which are essential to professional writing.

The second topic from contemporary rhetoric which has special applicability for the professional writing classroom is invention. Invention is not new, but some of the heuristic schemes developed recently are. Many of them propose to help the inexperienced writer find subject matter to write about. But the professional writer does not often need that kind of help. For the professional writer, the topic is well defined by the task in front of him/her. What the professional writer often needs is a guide to help him/her figure out a way to come to a written solution to a certain problem. In short, the professional writer needs a problem solving heuristic scheme.

I will briefly mention and discuss a few invention devices which serve this special need of the professional writer. The first, and one of the best short heuristic devices, is Mathes and Stevenson's three part intellectual strategy fully explained in their text Designing the Technical Report (1976). It instructs the writer first to formulate the problem which his/her organization has asked the writer to deal with; second it asks the writer to state the technical or specific tasks which the writer is asked to perform; and third it directs the writer to formulate the instrumental purpose of the document which is to be written. This scheme clarifies the task for the writer and helps him/her arrive at a written solution to the problem.

Linda Flower's Problem Solving Strategies for Writing (1981) helps the writer discover strategies or intellectual routines which have been identified by cognitive psychologists. Although designed to help students unlock memory, this heuristic also leads the writer to see that writing can be approached as a problem to be solved and is amenable to mental routines used to solve other problems.

One final example of a problem solving heuristic which is specifically applicable to professional writing is a cultural heuristic derived from anthropologist, Edward Hall (1959). It differs from the others mentioned in that it emphasizes subject matter categories rather than intellectual strategies.

Hall has defined ten primary message systems which in effect are cultural subject matter categories covering possibly all topics and all channels by which humans communicate. These are primary in that they have roots in biology. Before I define them briefly, let me point out if these categories in fact cover all human topics, then they might provide perspectives through which to view any problem so that no angle is overlooked in an attempt to find a solution. The ten primary message systems can be defined as follows:

1. Interaction is the reactability of all living substance to stimulus. The most basic form of interaction is the reaction of a cell to stimulus. A more complex form is reaction to language by human beings.

2. Association involves forming of groups and the resulting rank or status which follows from grouping. The grouping can be vertical and hierarchical or horizontal and egalitarian.

3. Subsistence is the process of obtaining whatever is necessary to maintain life. It involves micro and macro economic systems from primitive agriculture to sophisticated technological-industrial economics.

4. Bisexuality is the system by which society assigns cultural roles which differentiate male and female. It is society's indication of a desire to polarize some aspects of sexual behavior. (This widespread cultural differentiation is of course being challenged in some ways by feminist movement.

5. Territoriality is the system which involves location, orientation, and boundaries in space, personal and otherwise.

6. Temporality is the system which concerns time, timing, and rhythmic occurrence. It involves past, present, future, and change.

7. Learning is the intake of data in order to respond to or ignore the environment.

8. Play is a pleasure-giving experimentation with the environment in regularized (by rules) or non-regularized patterns. It is testing the possibilities in the environment.

9. Defense is the system involving any activity which wards off harm or danger.

10. Exploitation is the system by which man uses things in the environment to serve his purposes.

The ten PMS categories can become a problem solving heuristic if they are converted into questions with which to probe the problem. (DeGeorge, 1980). Each question provides a way to view the problem from one of the primary categories of human behavior. Theoretically then the problem should be covered from all angles. The questions are as follows:

1. Is communication or interaction or stimulus/response a factor in the problem? What interaction in the organization is involved?

2. How is grouping or ranking or status involved in the problem? In what way is ranking or association involved in the organization?

3. How does subsistence or the acquiring of goods, necessities, profits, wealth, capital, etc., figure into the problem? Is the subsistence of the organization involved? How?

4. Is sexual differentiation between male and female a factor in the problem? Is sexual differentiation in the organization involved?

5. Is territority of boundary or place or space, literally or figuratively a factor in this problem? Is the territoriality or physical environment of the organization involved?

6. What factor does time play in the problem? Change? How are patterns or cycles of events involved in the problem? How does time involve the organization?

7. In what way is learning a factor in the problem? What is to be learned? How can it be taught? Is learning in the organization involved?

8. Is play or testing or experimenting a factor in this problem? How is play or testing out the possibilities a factor for the organization?

9. Is defense and against what or whom a factor in the problem? Is the defense of the organization involved? How?

10. What persons or things in the environment can be beneficially exploited or used to solve the problem? What resources of the organization can be exploited beneficially?

In all questions the organization mentioned is, of course, the one which provides the context for the problems.

The purpose of this paper has been to suggest that some of the New Rhetorical concepts can have special application for instruction in professional writing. In particular sentence combining and problem solving heuristics can be not only useful for teachers of professional writing, but can become very precise tools to achieve very precise objectives.

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Panel F-20

What Beginning Teachers Should Know About Teaching Business and Technical Wr_ting

# THE COMPUTER, THE MANAGER, AND THE TEACHER OF WRITING

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Although he is totally unaware of it, the teacher of writing in English departments is facing what seems to be an unholy convergence with managerial written communications and the computer-based electronic office. The latter may seem at best to be an exotic term, and at worst a dark, ill-defined threat to the existence of English teachers. We may see it as a foreboding juggernaut encrusted with silicon chips that is out to do in what is left of our humanistic academe--our own private Darth Vader who holds aloft a blazing sword of software, with which he threatens to lop off our literature-worshipping heads with a single swipe. We hold that writing properly carried out should be done at worst with a typewriter (preferably on rag content paper); better still on parchment with a quill pen. In any event, it should not be in arcane typefaces blooming in ghostly images on computer terminals.

But whether we like it or not, the action is in business, engineering, <u>and</u> computers. Virtually every news or business magazine has devoted a large section or an entire issue to the so-called reindustrialization of America; President Reagan's entire tax program is calculated to support such a renaissance. Let us assume that business, government, and the people in general join in such an effort as I think that we must. Then the thrust of education and training <u>must</u> be toward business, engineering, and the supporting sciences.

With the continuing slide in enrollment in English departments and the burgeoning enrollment in business and engineering schools, most of us sit salivating on the sidelines wondering how we can get in on the action. And as a part of that process of wondering, we speculate what--if any--concessions that we must make as the price of admission to get aboard that gravy train. Remember that most of us have rather rigidly maintained that if the student can write about literature, he or she can write about anything. In essence, we the expert leave the extrapolation to the inexpert. I am not here to argue either <u>post hoc</u> or cause and affect; but I do argue that the sickening slide in enrollment continues--and we are at least party to sending into industry and business young men and women who do not have the necessary ability to write and speak.

A study published in the Spring 1980 issue of <u>Human Resource Management</u> brought out that both the deans of business schools and personnel executives in industry considered that B-schools were doing "'fairly well' in meeting the needs of the business sector," but they saw areas in need of improvement.

Those areas were these:

---Higher, more selective standards for admissions.

---More interaction and meaningful dialogue among faculty, students, and business leaders.

---More basic liberal arts courses in the curriculum.

---More emphasis on analyzing and solving problems.

---More emphasis on developing oral and written communication skills.

---More emphasis on the application of theory and learned skills to practical business problems.

Now English departments cannot fill all of those vacuums, but I think that we can do more than you realize--and I will deal with that later. The important thing is that these six current needs have been defined after surveys of current employees by higher level executives, especially in personnel divisions. In other words, the needs of potential students that you may be faced with teaching how to communicate adequately will very likely be those listed just above.

But before you rush into some business, lance down and at full gallop, you must realize that teaching lower and middle management is somewhat different from teaching college students. I don't mean to be patronizing, but there are some differences that could easily escape you. Writing in business is much more specialized than even that writing that is taught in business writing courses: we have not the foggiest notion which company in which industry will engage one of our accounting graduates, so we must pretty much stay in the middle of the fairway. Worse still, students later to enter management, finance, marketing, personnel work, and others will have their own particular writing needs--even if they were going to the same company (which they are not).

And the intra-industry variations are not inconsequential. Each company is the product of shaping by the industry that it is in and by the people that it employs, many of whom have come from competitors. For instance, I was employed by Container Corporation of America, St. Regis Paper Company, and Inland Container Corporation. All produced corrugated paper boxes used to ship a wide riety of other products; all competed in the Southwest and other parts of the country--and by all rights, all should have done things the same way and shared the same philosophie .

But they did not. All looked at me through different ends of the telescope, and my second and third acculturations were even more trying than the first. You may have been subjected to similar sorts of cultural shock as you have moved from one campus to another, encountering senior academicians with different horizons and administrators differently lamebrained.

As a university is shaped by its faculty and staff, its students, its location and environment, its mission, its competition, and its heritage, so is a corporation shaped similarly. Each is different, and communication within and without is different. Many of the differences are counterproductive, and a company may be slowly strangling from writing and speech that is ineffective or information transmission that is imperfect. We as writing teachers cannot deal directly with the latter, but we do need to be aware of what is available on the market now, as well as what is expected to be available in the very near future. And we certainly can deal with the former: ineffective writing and speech.

First, realize what sort of writing instruction young submanagers with BBA's are likely to have received in the past few years. They received at most universities one or two semesters of freshman composition--maybe. In that all of the jobs have been in business the past few years, B-schools have attracted a high percentage of the bright, energetic, aggressive students. And those bright students, in many cases, received advanced standing in composition or placed out of it completely. Their GPA's and their SAT's and ACT's do not mean that all of them can write; they just mean that they are bright: the chances are reasonably high that they never wrote a single, solitary paper in high school. All are required to take business communications in their junior year, but classes here (as at most schools, I suspect) run to forty or more. Here, as at the University of Texas at Austin, the business school has 25 percent of the total number of students, but they have 10 percent of the faculty. So the students don't get to write as many letters, memoranda, reports, and proposals as they would if the classes were 25 or less. Hence the students go forth to do battle in industry with the slenderest of writing credentials. Most of them are well-trained technically in accounting, computer information systems, marketing, and finance, but in the main, they just have not had sufficient opportunity to put their thoughts into writing.

Second, I think that it is imperative that we examine what is bearing down on us as well as the business community. Because of automation and other manufacturing efficiencies, the workforce in industry has been slowly shifting from the manufacturing plant into the office. In fact, in industry as a whole, over 50 percent of the workforce is now in the office, and the shift is still continuing. And most of these people, whether by means of computer terminals, word processors, or dictating machines linked to secretaries, are having to write--and write in great quantity. Some companies seek rather costly ways out out of the predicament. Some months ago, I spent the afternoon talking with the vice president of a local manufacturing firm about on-site classes of several descriptions. When I asked his about the writing capabilities of his engineers, he rather airily dismissed the problem. He said, "Oh, none of our engineers can write, so we just hire English majors as secretaries." It would seem to me that that is winning the battle but losing the war. Reasonably competent secretaries are demanding (and getting) $14,000 and upwards in Austin and probably more in more highly industrialized cities--even if they do not have a near-degree or better in English. Worse still, such a policy seems to me to be on collision course with the developing electronic office.

I do not think that many of us are equipped to visualize what is almost certain to happen in written communications in the next five to ten years. A friend of mine in the math department who does not generally lean towards hyperbole said that he expects the microcomputer to have more effect on our civilization than the whole of the Industrial Revolution. Already such firms as Xerox and Datapoint have ready for installation complete electronic office systems that combine data processing, word processing, electronic data transmission, electronic rather than carbon-copy files, and communications management. For example, carbon copies of letters and memoranda will be replaced by electronic impulses stored on discs. They will not be available for retrieval filed in a folder in a filing cabinet under just a single heading, but they will be available under almost any number of "headings."

Let's say that that you are trying to locate the "copy" of a letter you wrote in May 1981. You have forgotten the name of the company, and all that you remember of the person's name is that his first one was Frank. Further, you remember that the subject matter was brass high-pressure steam valves. Actually, that is more than enough for the search system developed by Datapoint. All you must do is sit down to the terminal, type in May 1981, Frank, brass, high-pressure, steam, and valves, and the computer will search the entire data base for letters written in May 1981 that had all of those words in them. All you will have to do is visually sort through the very few that are presented on your terminal cathode ray tube (CRT). Then, if you like, you can print out a copy of the letter on a nearby printer. Today, with our paper files, you would <u>have</u> to remember the name of the company that Frank worked for, or you would be in deep trouble. Even if you did, your secretary would have to dig the copy from the files. If it had been written in preceding years, you or your secretary would have to go out to a storage room, lift down a heavy transfer case, extract the copy, and replace the case. Then when you wanted to refile the copy, you would have to repeat the whole process.

Or let's say that you are a marketing representative who has just checked the hotel a thousand miles from your home office. You have picked up some information that your office badly needs. You merely plug in your personal terminal (it is about the same size and weight of a portable typewriter), connect your room phone to the terminal "interface," dial the office number, type the message to the proper person, and the memo is immediately printed by the printer nearest that person's desk. Or it can be held in storage until that person tomorrow morning "asks" the terminal what messages he has received overnight. In either case, he has the information at 8 AM tomorrow morning. Thus the constantly worsening national mail situation of slowing deliveries and increasing costs is solved by what amounts to an in-house delivery system that extends nationwide. Mail may be accumulated in electronic storage during the workday, dumped into the telephone or satellite transmission system during the early hours of the morning when transmission rates are extremely cheap, and then printed out in the proper offices all over the nation by 8 AM the next morning. Or our salesman can get copies of the latest price lists, delivery schedules, production changes, etc. without having to resort to scribbling down figures from a telephone conversation.

Raw data can be entered into the information system where it can be analyzed statistically, and the findings can be printed out or displayed on CRT's alphanumerically or in a wide variety of color graphics for examination by people who are engaged in an electronic conference in Hong Kong, Basle, Stuttgart, Capetown, Dallas, Tel Aviv--and even San Marcos. A group of people would be talking in writing to one another--without benefit of secretaries to correct the spelling and mushy syntax of executives and engineers. All will have to be able to express their thoughts via keyboard quickly and accurately, or the advantage of the electronic conference would be lost.

Let us just say that the executive or the engineer has a secretary for most of his typing. If he has the ability to edit his own dictation effectively, then he has significant advantage over that person who must wait for his secretary get his amended thoughts into unfractured syntax. So the person who can write, as well as operate a word processor, has the capability of doing major surgery on his material and then get on to other matters.

The advances in hardware are coming on the market so rapidly that one must consult with manufacturers almost daily to stay current with the market. For example, Xerox introduced its Ethernet system, which is capable of linking all the electronic equipment in an office regardless of who manufactured it. Then it introduced a microprocessor that is said to be more flexible but less expensive than the TRS-80 Model III or the Apple II computers. Further, with certain additions, it can take on word processing capabilities--and be under the price of the competing Wang. I believe that one thing is clear: as the hardware gets cheaper, lighter, and more flexible, more and more opportunity will be available for the manager or engineer to do more and more of his own writing. And the secretary/grammarian will slowly join the dinosaur. Or even more likely: the inarticulate manager will join the dinosaur, and the secretary/grammarian will take <u>his</u> job!

A potential teacher of writing in business must realize that <u>at present</u> there is a very wide range in the levels of office automation among the thousands of American businesses. Probably most at present are limited to accounting and business records computers and Selectric typewriters. But many have moved into word processors or the so-called intelligent typewriters. These range from little more than self-correcting units to processors that will allow deletions, additions, corrections, reconfigurations in layout, changes in format,and other editing of a wide variety--all without retyping.

The race for the electronic office market is just really started, with almost every manufacturer already in or preparing to enter the race. The software (the instructions by which the computers operate) is probably the worst bottleneck in the conversion at present, so many top executives are a bit wary about leaping into an electronic setup that is improperly programmed. But leap he must eventually; as was mentioned above, over half of the workforce is now in offices, and the nember is increasing. Further, management has suddenly realized that industry has invested over eight times as much per capita in the plant as they have in the office. So automation in the office is not a matter of "if" but instead "when."

So if the teacher of writing goes into one of America's corporation, he must expect to find the communication system at almost any level of sophistication. Many of you may find that the secretary is the best writer in the office --and she is at the bottom of the totem pole and the only one who is not on a career track. However, that situation cannot continue for long, for at least two reasons. First, business is having an awful time getting secretaries who can translate strangled jargon and twisted syntax produced by engineers and systems analysts into something that resembles English. So the price of articulate secretaries is being bid up in the marketplace. And second, and as a consequence of the first, the cost of a secretary to handle even the simplest writing is reducing the cost advantage of the electronic office. So a certain amount of the keyboarding is going to have to be taken over by the manager himself, especially for short memos and calling up information from the computerized files. Hence the manager who can write simply and clearly--and can mechanically do the writing himself--will find less impediment as he seeks to move up the managerial ladder. Your job, as teacher of people already in position, will be to determine where the company is with respect to office automation, and prepare them for what is already there or inevitably approaching.

Insofar as some of the shortcomings of business schools mentioned in Human Resources Management are concerned, they fall outside of the province of this paper. True, most BBA's and engineers do not get enough humanities, but I have a notion that most of us would say that they really need three hours of what I wrote my thesis on. However, three more hours of anything may not be the answer. We in the humanities, in spite of our love and respect of rhetoric, just may not be communicating with these youngsters. We just may not be getting through to them that they come to college for two reasons: to learn how to make a living, and to learn how to live. I suspect that most of us miss the target on the latter.

Oral communications may seem not to be our bailiwick either, but that may be a copout. If we condemn the B-school faculty for not requiring enough writing from their students to keep their skills sharpened, then the speech department is perfectly within its rights to do the same to us. Hence in a new course that I am opening in report and technical writing, I shall require an oral presentation of a written proposal that the class must grade as to its effectiveness. I know that oral as well as written presentations are a problem for industry. A senior vice president of a computer manufacturing firm once told me that he had watched a succession of bring young people come before the executive committee with ideas or proposals that they wanted the committee to back. He said that he suspected that many of the ideas had a great deal of merit, but those presenting many of them did such miserable jobs that the president often interrupted and excused them before they completed their presentations.

Problem solving can be our bailiwick. For example, if someone comes running in howling that the billing department is all screwed up, the manager should not pick up a club and head for the billing department. Its being screwed up is most likely a symptom and not a root problem. In most of our writing courses, we probably do not stress isolating and defining a problem nearly as much as we should. Read Barry Commoner's book, The Poverty of Power, which has been lauded by reviewers as being one of the most comprehensible of treatises of recent years. His approach throughout is to isolate a problem, define it, and give an example. When he examines a problem, you may not agree with his treatment, but you understand what he is talking about. Each spring, I teach a second-half freshman composition course to just business majors who must deal with situations drawn from a casebook. I require them to take the case apart, locate the core problem, determine all possible solutions, pick what seems to be the best, and then prove to me why it is. I think that the approach is valid, because managers spend most of their time solving problems. In fact, if there were no problems, there would be precious few managers drawing substantial salaries.

Now how does the professor of rhetoric or composition translate all of this into a class or seminar? First, there is going to have to be some preparation on your part. Go to one of the manufacturers or to his local sales office and get a better overview of the state of the art than I have been able to give you here. I would suggest Datapoint, IBM, Xerox, or Wang. Don't be backward about asking for demonstrations and explanations, as what I suggest here has to do with our actually pretraining our students to function better on their equipment when they graduate and go to work. For example, Datapoint and IBM have me an entire morning of each of their time, with the help of a total of eight people. And there was only me.

Then go to whoever in your math or computer science or computer information systems department is best staying abreast of developments in hardware and software, and then pick his or her brains. Audit or squat in a course that deals with an overview of computers. You don't need to know programming itself, but you do need to know the potential (and limitation) of mainframes, minicomputers, microcomputers, and word processors. And you need to know how to <u>talk</u> to a programmer.

Then go to your prospect firm and see if they have a treatable problem. And while you are at it, start as high up the ladder as possible. A general manager or chief executive officer can see problems, and he moves and shakes. Besides, it is often suicidal to have to try to go over the head of your original contact later; managers can often be as pettish as deans and provosts.

Insofar as the particulars of writing itself, I think that there are certain universals: simple, clear, and direct writing is effective anywhere. And most people in rather esoteric environments--whether in business or in academe--usually feel driven to unconsciously indulge in what a psychologist friend of mine called penis-waving: they just <u>have</u> to show everyone else that they belong to the group. So they spray specialized jargon and clotted syntax around like a randy tomcat. One of the hardest jobs that you will encounter will be to convince businessmen that simple language is the best: more people can understand it. The shorter the word or the sentence or the paragraph, the better. Maximum comprehension by the reader while he is quickly scanning is a major goal, as the reader has only one commodity to sell: his time. The best possible memorandum is one that is so clear that the reader cannot misunderstand it even if he wants to. In literature, writing is generally the end; in business, it is only the means to an end--generally to move people to do something that they do not want to do.

Look for individual corporate style, but leave it alone unless it interferes with effective communication. Some of it has its roots with someone far up the corporate ladder--the chairman of the board or his wife or his mistress. It is often like the picture of the wretchedly plain little girl whose face is all over the carton. She turns out to be the sainted aunt of the president, and the company is stuck with her, regardless of how many sales her gargoyle face kills. So if some trite phrases and construction just have to exist, just work around them--and use them as infrequently as possible. Do the same with industrial jargon. It can be extremely effective and economical IF everyone addressed in the memo or letter knows exactly what the jargon words mean. Besides, jargon serves to agglutinate people within a company or an industry.

Now as to methods of teaching. I am firmly convinced that you should limit classes (if you have them) certainly to a corporation, and preferably to a division or a large department. If the people come from one area within a corporation, they will talk much more readily about communications problems that they have, and they will bring in all sorts of actual examples of bad writing, most of it current. Such a situation gives you hands-on experience in examining and treating real writing problems that are impossible for you to duplicate. Also, you get to talk about the dynamics of why and to whom something was written to begin with. That can be crucial in any discussion of writing.

Should there be classes at all? If the general manager insists, do so: most people end up liking what they asked for. However, I have found that many classes scheduled for middle management are not consistently attended enough for them to be as effective as I desired them to be. The people are too often in Stockholm or Dublin or Rome or London or Tokyo or New York or Bug Tussle or God knows where, and you find yourself having a problem with continuity. Most managers just cannot be available for classes at a particular time for even a couple of months.

Workshops, in my experience, are a lot of fun if you have a lot of flash and pizazz. But you had better grab your money and run with it, because I have never seen one in which anyone learned very much about writing; there is just not enough time.

Although I have not tried it as extensively as I should like to have a firm judgment, I believe that the system that works best for most instructors in most industrial firms is for them to function as a sort of in-house grammarian. Use short classes--twenty minutes or so--to set forth points that all need to consider. But for most of the contact and instruction, set up a day each week during which you drop around and visit each "student" for fifteen minutes or so, and examine and critique all that that person has written that particular week. You and your student will be dealing with how he has solved actual problems that he has encountered, and there is just not a better environment in which to teach anyone to write!

But there is a benefit to you as a teacher that is easy to overlook. Any experience that you can gain in industry will be absolutely priceless in your regular classes back on the campus. I have found that business, engineering, and science majors can be reached much more easily if you can bring in non-campus business experiences of your own--even if they are not from exactly the right work environment. Most of us have a difficult time teaching writing just because we have not had much or any business or industrial experience. So your getting off-campus may very well enrich you in two ways.

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TEACHERS OF TECHNICAL WRITING

Thomas L. Warren
Oklahoma State University

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TECHNICAL COMMUNICATION, see below, Organizations, STC
JOURNAL OF TECHNICAL WRITING AND COMMUNICATION, Baywood Publishers, Farmingdale, NY 11735
THE JOURNAL OF BUSINESS COMMUNICATION, see below, Organizations, ABCA
IEEE TRANSACTIONS ON PROFESSIONAL COMMUNICATION, IEEE, 345 East 47th Street, NY 10017

Organizations

Society for Technical Communication, 815 15th Street, N.W., Washington, D.C. 20005*
Association of Teachers of Technical Writing, c/o Nell Ann Pickett, English, Hinds Junior College, Raymond, MS 39154
American Business Communication Association, 911 South Sixth Street, University of Illinois, Urbana, IL 61820*
Council for Programs in Technical and Scientific Communication, c/o Dr. Dave Carson, President, LLC, R.P.I., Troy, NY 1218[illegible]
Society for Scholarly Publication, 2000 Florida Avenue, N.W., Washington, D.C. 20009*
Document Design Center, American Institutes for Research, 1055 Thomas Jefferson Street, N.W., Washington, D.C. 20007
OTHERS:
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# TRANSFORMATION: FROM LIT PROF TO TECH WRITING TEACHER

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## SUMMARY

English teachers more and more face two choices: to teach technical writing or not to teach at all. While the choices may seem bleak to those who have never taught technical writing but who do want to teach, the decision to switch (whether voluntary or forced) requires certain changes. These include retraining and rethinking to make the transition from literary scholar to technical communicator. This paper outlines the steps toward such a change, the end result producing a transformed English teacher with all the skills of one's literary background put to good practical use in the technical fields.

## INTRODUCTION

While a tending a recent seminar for teachers of technical writing, I became aware of the phenomenon I had already been contemplating for some time: the rift in the profession between teachers with technical backgrounds and teachers with literary backgrounds. Once again the question arises: Can the twain never meet? Much, of course, has been written on the subject but apparently not enough to settle the question, which continues to be argued with increasing vigor on several fronts (ref. 1).

As a "lit jock" (ref. 2) who teaches technical writing at an engineering college, I feel certain pressures from those in the scientific and technical fields to "account" for my existence. If one can take solace in numbers, I am able to derive a certain comfort in the knowledge that my situation is not unique, but is experienced by many of my colleagues throughout the country, and will be shared by still more as two-year and four-year institutions continue to add technical writing courses to their curricula. With such a rapid expansion of the technical writing curriculum nationwide come several questions: Why are technical writing courses becoming so popular? Who is going to teach them? And what must a teacher's credentials be? The answers to these questions form the basis of this article.

## THE POPULARITY OF TECHNICAL WRITING COURSES

Among the many reasons for the marked increase in technical writing courses on the college level are the following.

1. Today's scientific, technological, and technical students, the future leaders of tomorrow's technological movement, must have the ability to communicate their knowledge and expertise, both to their peers and others. Their employers repeatedly stress the need for such skills and seek employees who possess them. Therefore, technical writing courses must be a part of any scientific curriculum.

2. If scientists must be able to communicate effectively with their peers and others, who is going to communicate the scientists' knowledge to the user?

Enter the technical writer, whose job must be to translate highly complex material for general consumption by large numbers. Thus, technical writing courses are being developed for him, and the number of communications majors increases as the demand increases.

3. That takes care of two specialized groups, but what about the English major? Their number has been diminishing rapidly over the past decade as the need for greater specificity and accountability have become the requirements of an increasingly expensive college education. Technical writing skills lend practical application to an otherwise humanistic pursuit of Great Works and allow the English major to continue study in his chosen field while adding a marketable dimension to his degree.

## THE TECHNICAL WRITING TEACHER

Few, if any, would quibble with the correctness and even desirability of scientists or engineers or technologists teaching technical writing to scientists or engineers or technologists if they have a firm grasp of writing skills, grammar, and usage. There are, of course, excellent teachers possessing such skills; but not many. More often such individuals find happiness (and higher salaries) in the fields of science or engineering or technology. Likewise, if they hold degrees in technical writing, they are likely to be employed by industry or government, not by academia.

So that leaves the English teacher, who, with his or her traditional degree in literature and/or composition, is usually regarded with suspicion by the scientific sphere. It also leaves the English teacher because he or she is already on campus teaching courses for which there is a lesser and lesser demand. Granted, the English teacher's degree in literature or composition does not automatically qualify him or her to teach technical writing; but a "lit jock" does bring certain strengths to the teaching of technical writing, and the weaknesses can be removed through education and exposure to the technical and scientific environment.

## THE ENGLISH TEACHER'S STRENGTHS

He knows good writing when he sees it, he knows how to produce it, and he knows how to communicate the techniques to others. He also knows intimately the rules of grammar, punctuation, spelling, and syntax. He understands the methods of organization and development, and he can convey these to others. He knows the value of editing as a crucial step in the development of the product. He also knows how to analyze his audience and to deliver the message appropriate to that audience. How does he know these things? By the nature of his studies and his teaching, he has read, and continues to read, a lot, and he has written, and generally continues to write, a lot. Most of his writing has undergone his own personal scrutiny as well as the scrutiny of others. Such skills apply clearly to technical writing.

Additionally, the English teacher can provide a sounding board for his students. As he is not likely to possess their intimate knowledge of technical or scientific material, he is in an excellent position to judge whether they communicate their information in a format that the lay reader can understand. He then becomes a real member of the audience most technical communication must reach. Yet, with all the things the English teacher does know and with all the skills he does possess, he has a number of important gaps in his background that he must fill if he is to be his most effective as a teacher of technical writing.

## THE ENGLISH TEACHER'S WEAKNESSES

He does not know technical language. He is unfamiliar with the daily dialogue between scientists or engineers. He is often equally without knowledge of graphics. He may also have trouble with the evaluation and interpretation of data or with the normal functions of a calculator that most engineers know by rote. He may be unfamiliar with the computer or word processor and he may never have known, or cannot remember, chemistry or physics. Yet his students are likely to be writing in these disciplines, and he may feel unable to evaluate their efforts.

In response to such admitted weaknesses, one must first dispel the notion that the technical writing teacher needs to know everything about everything technical. He does not, any more than a teacher of literature has to to know everything about everything literary. The day of the "Renaissance scholar" in any discipline is over, and while there are many who bemoan its passing, most have come to accept the limitations of specialization. Nonetheless, the teacher of technical writing does need to know something about some things technical. In other words, as Joe Rice put it recently, "He needs to get his hands dirty" (ref. 3). And that means exposing oneself to the discipline of technology to get a grasp of its language and style. This may for many require a certain degree of retraining, which becomes an ongoing process of metamorphosis or transformation.

## THE PROCESS OF METAMORPHOSIS

Change is gradual and continual, involving a number of options:

1. Audit courses in the field of science or technology. At Southern Tech, where I teach, I've already completed Building Materials, Specifications Writing for Architects, the History of Industrial Engineering Technology, Digital Fundamentals, Plant Tours, and a computer course in BASIC. At the same time, I'm receiving training on a word processor. This kind of instruction does not make me an expert in the various fields, but it does allow me to communicate with my students and to understand their reports by giving me the language and scope of their disciplines.

2. Invite professors from the technical areas to read student reports for technical content and to suggest a letter grade. A number of schools advocate such an approach, while others recommend an even closer role between the technical and English departments by structuring team teaching efforts of this type.

3. Attend professional meetings and join professional organizations. Become active on the local level in the groups that support technical writing. These include the Society for Technical Communication (STC), the Association of Teachers of Technical Writing (ATTW), The Conference on College Composition and Communication (4 C's), and the Modern Language Association (MLA) which now includes sessions on technical writing. If your area does not have a local STC chapter, then get together with other interested people and form one. The Atlanta chapter was defunct two years ago but was revitalized by interested people, myself included. We now have a strongly committed group of technical writers and teachers of technical writing, and in our monthly meetings we discuss topics of general interest, exchange manuals, examine graphics, and, equally important, get to know others in our profession to swap ideas, papers, contacts, and more. You can do the same.

4. Read textbooks. Your school probably already has a text for technical writing, and you'll of course read that. But don't stop there. Collect other texts and read them cover to cover. One text may be great on proposals, another great on graphics, and a third great on audience analysis. Cull ideas from all of these texts to add to your class notes and keep abreast of the latest trends in the field. Also order publications from NCTE like The Teaching of Technical Writing, which is a wide-ranging collection of essays originally published elsewhere, or the forthcoming technical writing casebook, which is being published by ATTW and which will include case problems for classroom use.

5. Attend one of the technical writing institutes. There are a growing number to choose from, at such places as Rensselaer Polytechnic University (Troy, New York), University of Washington (Seattle), Rice University (Houston, Texas), the University of Michigan (Ann Arbor), and Old Dominion University (Norfolk, Virginia). There you'll learn first hand about the variety and scope of technical communication, the latest developments, and the work being done by others.

6. Become a communications consultant. Go to local business and industry and offer your skills for in-house training in technical writing or for technical editing. Investigate the possibility of a summer job as a technical writer. Not only will you be providing a much-needed service for business, but you will take valuable and vital information back to the classroom with you in the fall.

7. Consider a continuing education course for the community on report writing or business writing and structure it with broad-based appeal for secretaries as well as managers.

All such kinds of exposure will increase your understanding of the field of technical writing and make your classes more meaningful to your students.

## THE TRANSFORMATION

"Literary types" can lead useful, productive lives as technical writing teachers. They can bring a humanizing influence to the technological disciplines and sharpen student awareness of writing skills by demonstrating the ways in which to make writing work in an organized, clear, concise, and correct manner. All that is required is a willingness to undergo a transformation, a new orientation to the business that English teachers have been doing all along: communicating. And, at the risk of waxing poetic and being accused of remaining an unreformed "lit jock," I'd like to conclude with this thought. The joy in teaching technical writing lies in its extreme practicality and immediate application. Our students will assuredly be asked to use what we teach them. The better they use what we can give them, the better they will be at what they do, the better the rest of us will understand and be able to use what they produce, and the better the world will work as a result.

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[1] Recent evidence includes the 1979 4 C's conference debate as to whether a technical writing program should be in the humanities or engineering department. Also see Keith N. Hull, "Notes from the Besieged, or Why English Teachers Should Teach Technical Writing," College English: 41 (April, 1980), 876-883.

[2] The term fondly (I hope) applied to me by certain of my colleagues to describe my traditional degree in English literature.

[3] As stated at The Technical Writing Institute for Teachers, Rensselaer Polytechnic Institute, Troy, N.Y., June 9-13, 1980.

# THE NATURE AND TREATMENT OF PROFESSIONAL ENGINEERING PROBLEMS: THE TECHNICAL WRITING TEACHER'S RESPONSIBILITY

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## INTRODUCTION

Rhetoric teachers often impute to engineering students a technical expertise in the treatment of problems addressed by professionals. This imputation has led to two general pedagogical tactics. The first amounts to a denial of responsibility for assessing the professional caliber of a student's treatment of a technical problem. Technical issues are seen as the domain of the technical student or his technical instructor, not of the rhetoric instructor. This particular version of territoriality is consistent with the historical emphasis in textbooks and pedagogical literature on mechanical, or formal, aspects of writing.[1] Moreover, these territorial bounds have not shifted greatly in recent years, even while pedagogical concern has broadened to encompass such issues as audience and purpose.[2]

The second pedagogical tactic goes even further and turns a supposed defect--the rhetoric instructor's lack of technical expertise--into a virtue: The teacher and student interchange roles to allow an avid communication specialist to be instructed in the mysteries of the technical problem and its solution. Such deference to technical expertise has led to the suggestion that students "be asked to instruct the teacher." [3] Another call for such role reversal is expressed thusly:

> As teachers of technical writing, we cannot expect to be more knowledgeable in our students' subject area than they have a responsibility to be. Thus we can and should hold them responsible for actually educating us in their disciplines. The realization that they are expected to know more than the teacher who reads their work may be unnerving to some, but it may well be the most important education we can provide them. [4]

Such deference to student technical expertise is disturbing for two reasons. First, the belief that the student is more knowledgeable than the instructor is valid only on one level--the level of subject matter, or of surface textualization of the technical materials. On a more meaningful level--the level of deep, or paradigmatic, structure--the student is often <u>not</u> an expert and the rhetoric instructor <u>is</u>, or <u>should be</u>. Second, the undifferentiated belief in the student's technical expertise leads, in our view, to an unfortunate emphasis on the academic, or textbook, approach to problems. Such emphasis may address the needs of an overwhelmed rhetoric teacher but does not address the central problem of the student attempting to simulate professional performance. In fact, the crux of the student's problem is to distinguish the academic treatments of textbook problems, which dominate classroom experience, from the profoundly different professional treatments of problems typically addressed by engineers. A pedagogy based on reversal of educational roles thus reinforces the commitment to academic treatments of problems whereas the student should be undertaking problems, and treatments, of a more professional ilk.

## Academic vs. Professional Problems

What, then, <u>are</u> the differences between the textbook problems given to students and the problems addressed by professionals? According to Thomas S. Kuhn,

> ...textbooks do not describe the sorts of problems that the professional may be asked to solve and the variety of techniques available for their solution. Rather, these books exhibit concrete problem solutions that the profession has come to accept as paradigms, and they then ask the student, either with a pencil and paper or in the laboratory, to solve for himself problems very closely related in both method and substance to those which the textbook or the accompanying lecture has led him. [5]

Though Kuhn is speaking of <u>science</u> textbooks, his distinction between academic and professional problems is equally applicable in engineering. The distinction is confirmed, for example, by engineering educator Jay W. Forrester of the Massachusetts Institute of Technology. According to Forrester:

> [The engineer] must identify the significant and critical problems, but in his education, problems have been predetermined and assigned. He must develop the judgment to know what solutions to problems are possible, but in school the problems encountered are known to have answers. He should be excited by new and unsolved challenges, but for 20 years he has lived in an educational system where he knows he repeating the work of last year's students. [6]

In short, both Kuhn and Forrester recognize, in broad terms, a radical difference between academic and professional problems. A more analytical contrast of the two types of problems is presented in the following table:

Table 1
Comparative Features of Academic and Professional Problems

| | Academic Problems | Professional Problems |
|---|---|---|
| Origin | discipline-generated (autotelic) | organization-generated |
| Nature | pre-formulated, fully specified | ill-defined, ambiguous |
| | closed | open-ended |
| | general, abstract, formal | specific, concrete, practical |
| | "ideal" | "real" |
| Scope | context-impoverished, fragmented, atomistic | context-rich, holistic |
| Solutions | homogeneous, mathematically tractable | heterogeneous |
| | pre-determined, unequivocal | provisional, multiple |

Thus, on the one hand, the problem addressed by the student has been pre-formulated and fully specified; the unequivocal answer required is obtained using a mathematical procedure which has just been introduced in the classroom. On the other hand, the problem addressed by the engineer is often ill-defined and is delineated along with various prospective solutions only through diverse engineering activities. The engineer then chooses among these provisional solutions on the basis of comparative evaluation of projected cost and effectiveness; in effect, tradeoffs are made to accomplish the most cost-effective solution.

## Dissociation of Academic and Professional Spheres

The enormous disparity between academic and professional problems is symptomatic of the long-standing dissociation of the academic and professional spheres of engineering. Surveying the history of engineering in the United States, Lawrence P. Grayson notes:

> Almost from its beginning engineering education in the United States was in all essential aspects a form of collegiate education, instituted and directed by educators, rather than practitioners. It was firmly established before the profession organized itself, with curricula in the various branches of engineering being taught and degrees offered, before the corresponding professional societies were formed. As a result, engineering education did not evolve from apprenticeship training and only slowly replaced it, gaining the support of practitioners with considerable struggle.... These

beginnings were directly opposite to the manner in which education for the legal, medical and dental professions developed in the United States, as they evolved out of apprenticeship on a purely practical and technic - plane, with none of the general qualities of collegiate education. [7]

Grayson is speaking of the origins of engineering education for the older specializations such as civil engineering--an education which, though not professionally based, was nonetheless technically rather than scientifically based. On the other hand, engineering education for some younger specializations, such as electrical or chemical engineering, was originally scientifically rather than technically based, and the dissociation of "the professional" and "the academic" was even more pronounced. Admittedly, educations in the electrical and chemical specializations evolved from their scientific origins toward a technical base. However, this evolution was halted in the post-World War II and post-Sputnik eras which saw, in fact, an increasing commitment to the pure sciences in engineering curricula. The incursion of pure science into the curriculum occurred at the expense of the technical component; the professional component remained virtually absent.

In the modern era, science courses predominate in the first two years of engineering curricula and a strong scientific coloration persists into the last two years of undergraduate study. Moreover, these scientifically oriented curricula have increasingly been taught by a faculty with a science-oriented education and little if any professional engineering experience. As the Goals Report of the ASEE notes: "Young men are entering faculty careers with doctoral degrees but with little if any experience in the practice of engineering." [8] The significance for students of having instructors with little or no professional engineering experience is summarized by Eric A. Walker: "There are engineers who graduate with little or no exposure to engineering because they have not studied with teachers who are engineers." [9]

What are the implications, for the rhetoric instructor, of having engineering students trained in a discipline dissociated from a professional base at its very origins, enrolled in a science-oriented curriculum, and taught by technical instructors lacking professional experience? One implication seems clear: Rhetoric instructors should not consider engineering students experts in the articulation and treatment of typical problems addressed by professionals. In the remainder of this paper, we further substantiate this assertion on the basis of our experience with a course in technical and professional communication. We discuss typical student difficulties in the selection and treatment of technical problems in simulated professional reports. Based on results obtained with questionnaires and in-depth interviews, these difficulties are traced to the use of academic materials as sources. Representative case histories are used to illustrate typical pitfalls in adapting academic source materials. We close with a few suggestions on the handling of the technical problem by rhetoric instructors.

## THE COURSE: THE DIFFICULTY

We are involved in a senior-level, multi-sectioned course in technical and professional communication in the College of Engineering of the University of

Michigan. The course objective is to train engineering students specialized in a wide variety of fields to write professional reports which are instrumentally useful for diverse audiences in organizations. Course assignments entail the generation of technical communications in which problems are formulated, and solutions advocated, for such audiences. The course is officially restricted to students who have had professional experience or who have taken, or are concurrently enrolled in, project or design courses. Theoretically, such students should have no difficulty in fulfilling the assignments; in fact, however, most of our students have great difficulty in properly selecting, articulating and treating appropriate problems.[10] Why?

In search of answers to this question, questionnaires and follow-up in-depth interviews were used over a two-year period among approximately 200 students. Three conclusions emerged: First, many students in the course have not had project or design coursework, much less professional experience. Second, most students have major difficulties in adapting their selected source materials to meet the requirements of professional engineering reports. Third, these difficulties occur mainly because students attempt to adapt materials of an academic nature. Lacking ready access to professional report materials, most students turn--somewhat understandably--to materials at hand, that is, to materials in their academic environment. Yet, as we have shown earlier, these materials usually differ profoundly from professional materials in both the nature and treatment of the technical problems addressed. Not surprisingly, then, the adaptation usually poses great difficulties. Typical student difficulties are portrayed in the following case histories.

## Case Histories

Case History 1. Lacking professional experience, Laura K. understandably turned to the most readily available materials--in this case, to a term paper written for a course in integrated-circuit technology and based on textbook materials. She therefore wrote a report, ostensibly at her supervisor's request, summarizing the procedural steps for manufacturing integrated circuits using several different technologies. Like the term paper itself, the report showed the characteristic preoccupation of students with subject matter, and was largely pre-engineering in nature. Though the materials earned an "A" grade as an engineering term paper, the report based on these materials was less successful. The response of an actual organization would surely have been: "How does this affect us?" or "Why should we know about this?" In fact, authorization of an investment to produce an organization report on so gratuitous a "problem" is unlikely. On the other hand, a report might be authorized to answer a question such as: Can changes in fabrication procedure increase the productivity of our manufacturing division and thereby increase profits? This question in fact provided the basis for a later, more successful version of the report. However, lack of sufficient quantitative data became a serious difficulty when she attempted to address a specific organizational problem. Thus, though some deficiencies were remedied in the initial adaptation of the term paper, new ones arose when the treatment of a meaningful problem was attempted: Clearly, Laura lacked such critical information as costs and yields under both the "old" procedure and the "new" procedure advocated in the report. Her solution, not uncommon in such cases, was to invent missing data slanted in the interests of rhetorical effectiveness--an exercise of highly dubious educational worth.

Such scenarios are common among students who, lacking any sort of professional experience, turn for working materials to lecture notes, textbooks, or their counterparts in professional journals, i.e., the tutorial article. The difficulties of Laura K. are representative: They were shared by Peter B. who wrote a report describing the architecture of a large-scale computer system based on lecture materials provided in a computer course; they were shared, equally, by David M. whose report discussed the general merits of high-voltage DC transmission based on a tutorial article in Spectrum, a journal of electrical engineering.

Case History 2. Like Laura K., Jeff R. attempted (some years ago) to base a professional report on an academic source--in his case, a tutorial article in Spectrum comparing the general features of smoke and heat detectors. Unlike Laura, however, Jeff initially contrived meaningful organizational and technical problems: The construction company for which he "worked" had seen a possible need, on the grounds of increased safety and marketability, for installing household fire-warning systems in homes then under construction. Jeff's task was to assess the need and, if deemed appropriate, to specify the hardware to be installed. This is a very plausible engineering problem; however, the execution of the task, as described in his report, was largely ineffective. His basic difficulty was improper selectivity: He failed to raise critical issues, raised others which should not have been debated, and treated still others in insufficient detail. As a result, many of his decisions seemed arbitrary and the report was unconvincing. For example, failure to recognize the relevance of building and occupancy codes was a serious technical omission which ultimately impaired the rhetorical effectiveness of his report. In fact, the code requirements provided the one incontestable argument for installing household fire-warning systems. An organization might approve the recommendation that household fire-warning systems be installed on the grounds of humanitarian concern and possible enhanced buyer appeal of the homes; it would certainly approve an installation which was a precondition for their sale. The failure to acknowledge requirements of operant codes led Jeff to consider issues which need not have been raised: His fairly lengthy discussion of the merits of smoke, as opposed to heat, detectors was relatively persuasive, though somewhat beside the point since the codes required the inclusion of smoke detectors. A more general characteristic of the report was a lack of sufficient detail. In consequence, his report recommended installing a system which seemed arbitrary in many respects: in the choices of ionization, rather than photoelectric, smoke-detector units; of battery-powered, rather than line-powered, units; of five units to protect a three-bedroom home; of the placement of the units; and, indeed, of the unit specified rather than one of the competitive units available.

But Jeff is not alone. His major pitfall, arbitrariness, is shared by many students. For example, inadequate treatment of cost factors is endemic in student reports. Unfortunately, a lack of sufficient detail is easier to diagnose than to correct. In Jeff's case an extended effort would have been needed to acquire the information needed to deal effectively with the issues involved. Choosing a smoke-detector unit for installation would certainly have entailed a comparative study of the specifications of commercially available

516

units. Accumulating a list of manufacturers, preparing letters of inquiry, and waiting for responses would have taken several weeks. Clearly, the total time and effort required for information acquisition can become disproportionate in a course on technical communication.

The above case histories portray representative problems encountered by students who, though lacking professional experience, are nevertheless asked to simulate professional treatment of a technical problem. As we have seen, many of these problems can be traced to the nature of the sources often used--textbooks, lecture notes, laboratory reports, tutorial articles.

## SUGGESTIONS

Based on the foregoing analysis of student difficulties in articulating and treating technical problems, a number of suggestions can be made to help teachers of technical communication deal more effectively with the issue of professionalism. These suggestions range from general speculations on the nature and placement of professional communication courses in curricula to specific heuristics for evaluating the treatment of the technical problem by the student. What follows, then, is a series of suggestions with comments.

### Course Design

<u>Suggestion 1</u>: Consider introducing students to professional problems and treatments in a communication course offered <u>early</u> in their academic programs.

<u>Comment</u>: We have found the case an effective means for confronting inexperienced students with a set of carefully metered demands to analyze, solve and report a "real-life" engineering problem within an organization.[11] The case problem chosen should be "real", of general interest to engineering students, and of circumscribed difficulty.[12] Case materials should probably be chosen with the cooperation of a technical faculty member or a practicing engineer.

<u>Suggestion 2</u>: Consider deferring a course in professional communication until <u>late</u> in the student's program, that is, until the senior year.

<u>Comment</u>: Such deferral, widely advocated in the literature, has several advantages.[13] First, more students will have had some sort of "professional" experience; certainly more will have taken either project or design courses--courses traditionally viewed as bridging the gap between "the academic" and "the professional." Second, regardless of the degree of exposure to professionalism, seniors will at least have more expertise with the technical subject matter of their engineering specializations. Third, seniors who are about to join the professional work force are understandably more motivated to acquire the communication skills needed by professionals.

<u>Suggestion 3</u>: Whether you decided to introduce your students to professional communication early or late in their program, design your course to bridge the gap between "the academic" and "the

professional" as that gap exists at your institution.

Comment: Consider both where your students are going to and where they are coming from. The nature and treatment of academic and professional problems have been characterized here in general terms. Beyond this, we recommend learning more about the standards and conventions your students will have to meet as professionals.[14] Equally important is the need to understand the degree to which your students have been introduced to principles of professionalism in their course work.[15] Clearly, answers to questions such as the following are helpful: For which engineering specializations, if any, is there a project- or design- course requirement at your school? Which of your students have had organizational experience through, for example, co-operative or summer programs? What pedagogical concessions need, and can, be made in the light of the backgrounds of students in an individual class?[16] In summary, profiles are needed for your engineering students in general, by specialization, and by individual class.

Report Evaluation

Suggestion 4: In reading reports, assume responsibility for assessing the degree of professionalism manifested in the articulation and treatment of technical problems by students. As a corollary, don't let students relinquish responsibility for simulating treatment of appropriate problems at a professional level.

Comment: Do not assume the student is an expert in the articulation and treatment of problems addressed by professionals. Students may have mastered technical subject matter, but not the treatment of professional problems. Lacking such mastery, students attempt at times to persist in treating problems in the academic mode, e.g., by imputing to a supervisor the assignment of an inappropriate task. Consider as suspect, then, any task assignment of the general form: "My boss asked me to [perform a sub-professional, or pre-professional, task]."

Suggestion 5: In examining reports, focus primarily at the level of underlying deep structure, or of disciplinary paradigms, rather than at the level of surface textualization of the material presented.

Comment: Be aware of the conventions underlying various discourse types in academic and professional writing. Armed only with a knowledge of the appropriate structural paradigm, the rhetoric teacher--however unfamiliar with the surface textualization of a given report, be it op amps or strain gages--can readily detect many serious flaws. Consider, for example, the structural paradigm for a problem-solving organizational report, which has the following elements: statement of the problem, methodology, results, conclusions, recommendations, and implications for the organization (i.e., cost, benefits, future actions required). A teacher familiar with this paradigm is able to question the omission of an element, such as recommendations, from a problem-solving organizational report. But both teacher and student can gain additional insight by comparing the paradigmatic elements of such an organizational report with their counterparts in the appropriate academic discourse genre--especially since, as we have shown, students tend to turn to such sources. Such a comparison is made in Table 2, using the student laboratory report as the academic discourse genre.

Table 2
Comparison of the structural paradigms for a student laboratory report and a professional problem-solving organizational report.

| | Student Lab. Report | Professional Report |
|---|---|---|
| Technical Problem | academic | professional |
| Methodology | highlighted | de-emphasized, if standard |
| Results | emphasized | details appended |
| Conclusions | emphasized, but narrow | emphasized |
| Recommendations | omitted | emphasized |
| Implications | omitted | emphasized |

In the case under discussion, recommendations may well have been omitted because they are not ordinarily called for in a student laboratory report. Table 2 illustrates, then, one example of the level at which you should be not only reading reports but also characterizing discourse types for your students. We are not advocating here an attempt to master the subject matter of, say, an electronic-circuits text or a dynamometer user manual.[17] We are advocating, rather, familiarization with the structural paradigms underlying discourse genres such as textbooks and user manuals.

Suggestion 6: Be aware that the norms underlying various engineering paradigms evolve, and try to keep up with changing conventions.

Comment: An example might be helpful here. The traditional professional design paradigm includes the following elements: function, cost, manufacturability, and marketability. Note, however, that traditional design education focusses largely on function. Following the method of Suggestion 5--detection of possible student errors through a comparison of academic and professional paradigms--we are led to expect, and indeed find, imbalances in student treatments of the four elements of the professional paradigm. But more relevant to our present point, this paradigm is evolving. Specifically, the addition of safety to the traditional design paradigm is increasingly regarded as mandatory.[18] Moreover, because this design criterion is just beginning to be recognized in engineering education, one expects its omission to be the rule rather than the exception in student writing. Trends such as energy and resource conservation, and environment protection, are inducing further evolution of the professional design paradigm.

Suggestion 7: Don't accept arbitrariness--a characteristic of the treatment of formal academic problems--at any level of a professional report.

Comment: Earlier, we noted that while academic problems are abstract, idealized and general, professional problems are concrete, "real," and specific. Thus, while a circuit may "operate at 300°K" in a textbook discussion, qualification is required in a professional description. The qualifications required in professional treatments of a problem often take the form of ranges. In the example just cited, specification of an operating temperature range would be required, e.g., 300+2°K. Similarly, the provisional, multiple nature of solutions to professional problems should lead you to challenge any solution deemed, in effect, unique. Remember that you need not know the correct answers to ask the right questions.

## CONCLUSION

In the above suggestions, and in the paper as a whole, we have tended to treat engineering in the broad sense as normatively conceived. But, as we noted in the case of evolving design criteria, norms change and the conventions for the engineering profession are neither monolithic nor static.[19] Nor are they ever fully realized in any given instance: The claim has been made, for example, that many of today's engineers are working at sub-professional levels.[20] How does the rhetoric instructor accommodate the statistically significant group of students who may have this destiny? Or to treat the other side of the coin, in effect, a certain number of educators--including ourselves--are calling for a new engineering professionalism.[21] Jay Forrester calls, for example, for a renaissance figure who "should act as the interface between technology, economics, organization, and politics."[22] What should be the rhetoric instructor's role in producing this new engineer? Whatever choices are made, pedagogical decisions have moral implications. And those decisions should be conscious and responsible.

## REFERENCES


1. See, for example, Fred H. MacIntosh, "Teaching Writing is the World's Work," The Teaching of Technical Writing, eds. Donald H. Cunningham and Herman A. Estrin (Urbana: National Council of Teachers of English, 1975), p. 29: "But make clear to your students that content is their responsibility, and that your concern is clarity of presentation..." The historical emphasis on style and arrangement is confirmed and related to the tradition of scientific positivism by Carolyn R. Miller in "A Humanistic Rationale for Technical Writing," College English, vol. 40, no. 6, Feb. 1979, pp. 610-17.

2. For a notable exception, see the pioneering treatment of the technical problem in J. C. Mathes and D. W. Stevenson, Designing Technical Reports: Writing for Audiences in Organizations (Indianapolis: Bobbs-Merrill, 1976), especially Chapter 3.

3. Moreover, we are told that students "enjoy the opportunity to teach their teachers." Paul V. Anderson, "Teaching the Teacher What Government and Industry Want from Technical Writing," Technical and Professional Communication: Teaching in the Two-Year College, Four-Year College, Professional School, ed. T. M. Sawyer (Ann Arbor: Professional Communication Press, Inc., 1977), p. 66.

4. Marion K. Smith, "What Should be Taught in the Technical Writing Course?" in Technical and Professional Communication, pp. 46-47.

5. Thomas S. Kuhn, "The Essential Tension: Tradition and Innovation in Scientific Research," The Essential Tension: Selected Studies in Scientific Tradition and Change (Chicago: University of Chicago Press, 1977), p. 229.

6. From a speech entitled "Engineering Education and Engineering Practice in the Year 2000" and delivered during the National Academy of Engineering session of the Engineering Sesquicentennial Celebration at the University of Michigan on September 21, 1967.

7. "A Brief History of Engineering Education in the United States," Engineering Education, Dec. 1977, p. 246.

8. Cited in Eric A. Walker, "Teaching Research Isn't Teaching Engineering," Engineering Education, Jan. 1978, p. 306.

9. Walker, p. 306.

10. For the occasional student with professional experience and professional report materials available, fulfilling course assignments poses no great difficulty. This individual need only select from personal files a report which can be adapted, if necessary, for purposes of the course.

11. For a discussion of our experiences with the case method, see Ben F. Barton and Marthalee S. Barton, "Bridging the Gap Between Engineering Student and Professional: The Case Method in a Technical Communication Course," Courses, Components, and Exercises in Technical Communication, ed. Dwight W. Stevenson (Urbana: National Council of Teachers of English, 1981).

12. These three criteria underlay our choice of a case problem. That is, we sought first a "real" problem representative of those actually encountered in practice by entry-level engineers. Second, we wanted a problem which could be handled without a deep understanding of concepts peculiar to any one engineering specialization, a problem which would permit a focus on the structural paradigm underlying all engineering specializations, i.e., the problem-solving methodology. Third, we desired a problem which could be treated adequately in a one-term, technical-communication course.

13. See, for example, J. C. Mathes, Dwight W. Stevenson, and Peter Klaver, "Technical Writing: The Engineering Educator's Responsibility," Engineering Education, Jan. 1979, pp. 331-34; W. E. Britton, "The Trouble with Technical Writing is Freshman English," Journal of Technical Writing and Communication, Spring 1974, pp. 127-31; and T. M. Sawyer, "First Things Last: Composition for Seniors, not Freshmen," Journal of Technical Writing and Communication, April 1971, pp. 139-46.

14. Paul Anderson ("Teaching the Teacher," p. 65) goes so far as to suggest that "[t]eachers of technical writing are not fully trained until they have worked as writing specialists in business, government, industry or wherever they expect their students to be employed after graduation."

15. Kenneth C. Rogers notes that there are "244 Engineers' Council-accredited schools of engineering, which offer over 131 different curricula"

("Engineering Enters New Cycle of Development and Definition," Science, vol. 209, 4 July 1980, p. 128). Given such variety, the need to familiarize oneself with the engineering curricula at one's own institution seems clear.

16. For example, it seemed appropriate recently, in a section which happened to have 10 students from a single chemical-engineering design course, to encourage team report-writing--an important aspect of professional activity.

17. Our position differs, then, from that implied by advice such as the following: "Your first logical question may be: how can I teach students to write about things of which I know very little? The first obvious answer is: Read the texts, materials, manuals, and instruction sheets your students use in their career courses. Most of these materials are simple and lend themselves to fast reading for general information." (Fred H. MacIntosh, "Teaching Writing is the World's Work," p. 29.)

18. See, for example, Tim A. Jur et al., "Engineering, the Law, and Design Education," Engineering Education, Jan. 1981, p. 274: "The elimination of unreasonable [sic] risks of injury has become a significant design constraint and must not be overlooked in the design education process." Also, J. M. Christensen, "Implications of Product Liability for Engineering Design and Education," Engineering Education, Dec. 1977, pp. 274-77.

19. See, for example, Kenneth C. Rogers, "Engineering Enters New Cycle," p. 128: "The powerful impact of the microprocessor, superimposed on the constraints arising from the energy shortage and resource depletion, will work to recast both the conceptual framework and the normative criteria of engineering."

20. William S. Byers, "Should Engineering Graduates Be Allowed to Become Technologists?", Engineering Education, May 1977, p. 761: "It is probable, by ECPD's definitions, that a majority of engineers in industry are performing as technologists." See also Clarence W. de Silva, "The Computer: Obstacle to a Meaningful Engineering Education," Engineering Education, Jan. 1981, p. 304: "... there are industries that often use qualified engineers as computer users rather than as productive engineering problem solvers."

21. Ben F. Barton and Marthalee S. Barton, "Toward Teaching a New Engineering Professionalism: A Joint Instructional Effort in Technical Design and Communication," in Technical and Professional Communication, pp. 119-28.

22. "Engineering Education and Engineering Practice in the Year 2000."

WHAT BEGINNING TEACHERS SHOULD KNOW ABOUT BUSINESS AND TECHNICAL WRITING

Carole Yee
Recorder and Respondent

## REPORT

Alex Stedman's paper "learning how to Teach Business Executives to Write" enumerated the skills English teachers can offer future business executives. Stedman recommended undergraduate students take more basic liberal arts courses to learn more communication and analytical skills. The manager who can write clearly and effectively will rise in the corporate structure, he asserted. He also stressed problem-solving as a skill that intersects composition, business writing, and the liberal arts

Tom Warren's "Help for the New Teacher of Technical Writing" provided an extensive and generous bibliography that answers these questions: What is technical writing? and How does technical writing differ from composition?

Carol Barnum's "The Metamorphasis of the English Prof: From Literary Scholar to Technical Communicator" argued that a literary background is an excellent resource for teaching business and technical communication. The English professor's skills are valuable and marketable to the technician, manager, and scientist. Barnum offered a number of ways for the English teacher to work with people in technical fields and thereby become more professional about teaching writing for those fields.

Ben Barton's paper, "The Nature and Treatment of Technical Engineering Problems," suggested that writing teachers use discourse theory to bridge the gap between the professional engineer and the academic engineer. The technical writing teacher, Barton said, can teach professional expertise to engineering students better than engineering professors who do not have practical and professional experience in preparing reports.

## EVALUATION

The general value of this session was in its promise to instruct the new technical writing teacher in getting started. The papers addressed this topic, and, generally, they were appropriately simple, direct, and clear. They all gave practical advice on the conversion from teaching literary writing to teaching technical and business writing.

Despite the practical advice, the papers seemed to assess their audience somewhat incorrectly. Each paper, and most other papers at the 4 C's session on technical writing, frequently assumed that the audience was made up of reformed literary types, people with degrees in literature, who, having seen the errors in their ways, were prepared to convert from literature to more practical and marketable interests, namely technical writing. The plea was made repeatedly here, and in other 4 C's technical writing sessions, for English teachers to turn away from literature in their teaching.

Unquestionably, many English teachers possess the skills to teach technical writing. Abandoning the humanities, however, is not the answer to educating students, including those preparing for careers in science, engineering, and business. An unspoken but real controversy about what belongs in the curriculum of today's students lay beneath the assumptions of this session. The technical writing teacher, whether new in this field or an old hand, needs to hear more discussion about the relationship between technical fields and the humanities, whose analytical and evaluative thinking can teach future technicians as well as liberal arts majors.

Perhaps this issue is a mere matter of tone. None the less, most technical writing teachers have degrees in literature and many, I suspect, are teaching technical writing because they believe their values as well as their experience pertain to these practical fields. The audience for this session and for other sessions on tech writing could well include composition teachers interested in what the world of business and technology wants from their educated people.

Panel H-5

# Coherence and Style in Technical Communication

# Using Sentence Combining in Technical Writing Classes

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Technical writing students have trouble learning technical style. And it's no wonder. As a discipline, we cannot fully agree on a definition of the term, and our textbooks' abstractions about what we do agree do little to help students who have not written since freshman composition. They cannot learn to write by following a series of abstractions, no matter how common-sensical they may seem. Students can, however, learn with writing practice. Sentence-combining exercises can give them this practice.

Unfortunately, few teachers use sentence combining in technical writing classes. First, they find that available sentence-combining exercises, those found in freshman texts, are inappropriate for their advanced students who want to write about their expertise, not about hamburgers or the Cincinnati Reds. Second, they fear that sentence combining will simply teach students to write longer (not better) sentences. Our own experience with asking juniors and seniors to combine kernels of specialized (i.e., technical) information, however, indicates that the process can be helpful in several ways: it gives students regular writing practice; it can teach the logic of sentence structure, sentence editing, and punctuation; paragraph development and organization; and rhetorical stance. If technical writing students learn as well as the freshman practitioners of sentence-combining, we can hope for significant and long-range increases in their writing quality.

What follows describes typical sentence, paragraph, and discourse level sentence-combining exercises using material appropriate for technical writers. All examples deal with agronomy, but we believe that these kinds of exercises can teach effective technical prose to writers in other disciplines as well. We realize the inventing, editing, and organizing skills taught through sentence combining can be taught by other means. Nevertheless, we urge technical writing teachers to consider this procedure which has worked with freshmen so well.

## SENTENCES

Used regularly throughout the term, sentence-level exercises can demonstrate at least four important things: how parts of the sentence work together, how a message can be expressed in different structures, how structure and meaning are related, and how material is often (but not always) better focussed when it is in a single sentence rather than in several overlapping ones. Our exercises are based on those found in The Writer's Options,[1] but contain specialized information. Like that text, during the quarter we explain a series of syntactic structures--coordination, for instance--and show when it can be used effectively (to indicate items of equal importance, as lists) and how it is punctuated (commas vs. semi-colons). Our students then work through an exercise that requires them to combine sets of sentences in imitation of the structure and to share their combinations. An excerpt follows:

Combine the information in each of the following sets of sentences by using a coordinate structure.

1. The major corn endosperm mutants can be divided into three classes.
   One class consists of corn mutants now in use.
   Potentially useful corn mutants are members of a second class.
   Another class consists of corn mutants that have no know use.

2. Some potatoes are not grown commercially.
   These are the Abnaki, Bellisle, and Cascade.
   The Hudson and the Snowchip also fall into this category.

Students may also be asked to evaluate how effectively a writer has used the structure; i.e., whether it reinforces sentence content. Another typical exercise on coordination:

> What items are coordinated in the following sentences. (Find the coordinating word.) Are they similar enough to deserve coordination?
>
> 1. The tall fescue clone, designated 80-1, had yellow-green leaf color and had been selected for resistance to Puccinia coronata and Helminthosporium spp.
>
> 2. Although a highly resistant fescue line served as maternal parent, a high percentage of C1 progenies...was susceptible to disease and therefore, susceptible plants failed to survive the winter.

Finally, they create original sentences incorporating the structure. With these short, regular exercises, students learn to analyze sentences carefully, to consider the relationship between form and meaning, and to practice sentence variety, modification, and punctuation. And because they share "answers" to the various writing problems, they become more aware of the possibilities of writing.

In spite of sentence-combining's apparent emphasis on sentence length, we all know that long sentences are not necessarily good sentences. A series of decombining exercises can help students see why a particular structure is unfocused and how it can be improved. These exercises ask them, first, to break up a sentence into smaller pieces of information and to decide which of the pieces are most important, which less important, which unimportant. They then eliminate repetition, revise for mechanics, and choose structures that are clearer (and usually shorter) than the original:

> The following sentence is not as clear as it could be. Break it into smaller sentences, decide what you want to empahsize, and organize your material into one or more sentences.
>
> 1. Considering only fresh vegetable use since 1970, the most important development is that the pattern of declining use has been checked, and there has been a slight upward movement each year since 1973.

--This generalization will concern the use of fresh vegetables since 1970.
--The use of fresh vegetables is no longer declining.
--The use of fresh vegetables has slightly increased each year since 1973.

Possible revision: Since 1970, the use of fresh vegetables has stopped declining; in fact, since 1973, it has slightly increased each year.

Students notice that the revision has reduced the 33-word original to 20 words. Early in the term at least, we have to point out that it also eliminates the dangling modifier and tightens the coordination.

## PARAGRAPHS

As the sentence-level exercises demonstrate, sentence combining shows a writer how to make a point and how to subordinate material to it. Paragraphs function similarly. Given a list of kernel sentences, students can choose a focus for a paragraph, select appropriate details to maintain that focus, and combine those details to edit and to emphasize. An alternative is the more directed assignment below:

Use the details from the list below to construct a well-organized paragraph that describes how the Moduleponics system operates. You may have to change the order of the details.

1. Moduleponics is a system based on hydroponics.
2. Hydroponics is a system that grows plants in water, not in soil.
3. Air is pumped into the reservoir.
4. The growing tube is filled with plastic gravel.
5. The second pipe is parallel to the growing tube.
6. The growing tube is 18 inches off the ground.
7. The air forces the nutrients into the growing chamber.
8. The second pipe is fed by an air supply line.
9. A second pipe is below the growing tube.
10. Moduleponics consists of a growing tube.
11. The nutrients feed the plants.
12. The second pipe is a reservoir for the nutrient solution.
13. Hydorponics can be very expensive.

POSSIBLE PARAGRAPH:

Moduleponics is a system based on hydroponics, which grows plants in water, not in soil. Moduleponics consists of a growing tube filled with plastic gravel. It is 18 inches off the ground. A second pipe, below it, is parallel to it. The pipe, a reservoir for the nutrient solution, is fed by an air supply line. The air is pumped into the reservoir, forcing the nutrients into the growing chamber. These nutrients feed the plants.

This exercise will help students recognize what belongs in a paragraph (most of them easily eliminate point 13) and consider order. Exchanging paragraphs, they learn how different structures can present the same data, and how structure affects emphasis and meaning. For those who need help organizing material within the paragraph once they've decided it belongs, the Christensen system of analysis,[2] which--like sentence-combining--relates structure and meaning, can teach paragraph organization and development. Students who revise according to the Christensen model can create paragraphs like the one below, one that is more effective than the earlier version because items that are equally important are phrased similarly:

> Like hydroponics, moduleponics is a system that grows plants in water, not in soil. This system consists of three parts. First is a growing tube 18 inches off the ground. It is filled with gravel. Second, parallel to and below the growing tube, is a pipe. It is a reservoir for the nutrient solution. Third is an air supply line which pumps air into the reservoir, forcing the nutrients into the growing chamber. These nutrients feed the pla s.

Finally, sentence-combining can give students practice in translating information for different, already-defined audiences. This cannot, of course, replace work in audience analysis, but it can give them the opportunity to gain skills in adaptation of tone, data, vocabulary, even sentence structure, once the reader has been defined:

> Below you will find a series of details. Study them. Then choose the details that would be appropriate for the reader of Wallace's Farmer, aimed at practicing midwest farmers. Translate those details into the language they will understand.
>
> Abnaki is a round-white potato which is not widely produced commercially.
> Bellisle and Snowchip are two other round-white types.
> Bellisle and Snowchip are also not widely produced for the commercially market.
> Nampa and Targhee are long russet types.
> Nampa and Targhee are not widely produced for commercial purposes.
> Butte is another russet potato.
> Butte was released in 1977.
> Butte has not had widespread commercial testing.
> Butte's commercial market potential is not known.
> Bison is a red skin variety.
> Bison has performed well in several studies.
> Bison might be the most promising potato for commerical use.
>
> POSSIBLE REVISION:
>
> Uncertain about what potato crop to plant this year? Don't grow Bellisle, Abnaki, Snowchip, Nampa or Targhee. They won't sell. Butte is chancy. It hasn't proven itself. Bison, a red skin, is your best bet.

This conscious attention to the reader is something all of our technical writing students have to learn. Practicing these transformations, even in these artificial contexts, can help them develop the writing skills they need.

## TECHNICAL FORMS

Sentence-combining exercises can also give students experience manipulating the unique forms of technical writing. This section describes assignments with proposals, progress reports, and sections of the technical report.

A proposal offers a service to the reader. Students, however, frequently have difficulty adopting a successful service attitude. In trying to be honest, they tend to concentrate on what they cannot do; at times, they raise such serious objections that they call into question the entire proposal. Discussions of responses to exercises like the following, which reinforce editing and organizing skills encouraged by the earlier sentence-level material, can show them how to acknowledge unfavorable information tactfully.

> Reorganize the following set of sentences into the opening of a proposal. Although you should include all relevant data, be sure to emphasize only selling points.
>
> 1. This is a preliminary study.
> 2. The results will necessarily be tentative.
> 3. Further tests will be required.
> 4. This study covers only a period of two weeks.
> 5. This study deals with only one kind of corn.
> 6. This corn is Shrunken-2.
> 7. Shrunken-2 has a high sugar content.
> 8. Shrunken-2 has low water-soluble polysaccharide (WSP) content.
> 9. No exact data on germination rates of Shrunken-2 exist.
> 10. It may have problems in poor germination.
> 11. These problems may occur in laboratory tests.
> 12. Shrunken-2 is popular among home and market growers.

These details can, of course, be organized in different ways; the advantages of the versions students offer should be discussed. One possible statement, for instance, follows:

> Although Shrunken-2 is popular among home and market growers, no exact data on its germination rates exist. This preliminary study will examine germination rates of this corn hybrid in laboratory tests over two weeks. Since Shrunken-2, which is high in sugar and low in water-soluble polysaccharide (WSP), may not germinate well under laboratory conditions, the results of the study will necessarily be tentative. Further tests will be required.

This revision has several virtues. The writer begins by explaining the need for the study. She then plays down potential weaknesses in the project: the fact that the data will be collected over a short period is presented neutrally; the possible difficulty with germination rates is subordinated; negative words like "problems in poor germination" are eliminated. Exercises like this teach students--through analyses and comparisons of their own controlled writings--various ways to minimize both familiar and negative information. The information about the sugar and WSP content, the distinguishing features of the hybrid, can also lead to a discussion of intended audience: how can the writer develop the proposal for the audience she has defined implicitly.

Similar assignments can demonstrate ways of organizing material in larger contexts. Kernel sentences like the following from a progress report can be provided.

> Study the following. Decide what information you want to emphasize and then organize it into a short progress report. Add any additional information you consider essential. Be prepared to defend your choice of organizational pattern and additions.

1. This is the first progress report.
2. It covers the period from January 1 to March 15.
3. It reports on the evaluation of the effect of vestigial glume character on tassel length and on pollen production.
4. Wisconsin sweet corn inbreeds were the plants studied.
5. Twenty sets were planted.
6. Twenty sets of normal corn were also planted.
7. Tassels were bagged and sealed for pollen.
8. Pollen vol ne was measured.
9. Glume length was measured.
10. Pollen ranged from .65 to 15.95 ml./tassel for Vg inbreeds.
11. Pollen averaged 2.99 ml. for the Vg inbreeds.
12. Pollen averaged 20 ml. for normal corn plants.
13. Tassel glume length ranged from .65 to 5.20 ml. for Vg inbreeds.
14. Tassel glume length averaged 3.75 fro the Vg inbreeds.
15. Tassel glume length averaged 11.93 for normal plants.
16. Neither the pollen volume nor glume length varied significantly ir the normal plants.

Most students r ize that the first four sentences, along with missing information about the authorization of the proposal, can comprise a transitional introduction. But the rest of the material, the "Work Completed," can be organized in several ways. Unfortunately, many inexperienced writers are unaware of the possibilities; sharing the results of the exercise can make them more aware. The writer who wishes to emphasize the products measured should recognize this pattern:

| | |
|---|---|
| Preparation: | Twenty sets of Wisconsin sweet corn inbreeds were planted; tassels were bagged and sealed for pollen. Twenty sets of normal corn were treated similarly. |
| Measurement: | |
| Pollen | For ; inbreeds, pollen ranged from .65 to 15.95 |

ml./tassel. It averaged 2.99 ml. For normal corn plants, pollen averaged 20 ml.

| | |
|---|---|
| Tassel Glume Length | For Vg inbreeds, tassel glume length ranged from .65 to 5.20 ml. It averaged 3.76 ml. For normal corn plants, length averaged 11.93. |

The writer who wants to emphasize differences between the inbreed and the normal corn plants should consider this variation:

Preparation: Same

Measurement:

| | |
|---|---|
| Vg Inbreeds | Pollen ranged from .65 ml. to 15.95 ml./tassel. It averaged 2.99 ml. Tassel glume length ranged from .65 to 5.20 ml. It averaged 3.76 ml. |
| Normal Corn | Very little variation. Pollen averaged 20 ml. Tassel glume length averaged 11.93 ml. |

And so on. Whatever the choice, discussions of the options help students to recognize relationships between material and organization, and to practice those relationships in these exercises and their own writing.

Other students have difficulty distinguishing elements of the technical report. Since the descriptive abstract and conclusion, for example, often contain some of the same material, inexperienced technical writers tend to repeat the information verbatim. Exercises that focus on material likely to be repeated can help them practice tailoring information, choosing and arranging details according to various formal requirements. Sentences like the following can be furnished:

1. This document reports the measure of pH levels of soil growing corn seedlings.
2. This document reports the measure of phosphate levels of soil growing corn seedlings.
3. The corn seedlings were grown for eleven days.
4. The corn seedlings were grown in two plots, Plot M and Plot R.
5. Both plots were fertilized with monocalcium phosphate.
6. Plot R was treated with nitrous oxide.
7. Rhizocylinder solutions were obtained from both plots.
8. The solutions were obtained by centrifugal filtrations.
9. The solutions were analyzed for pH.
10. The solutions were analyzed for phosphate.
11. The pH levels of both plots measured 4.6.
12. The phosphate level of Plot R was less than the level of Plot M.
13. Nitrous oxide increased corn root growth.
14. Corn roots absorb phosphates.

The descriptive abstract is little more than a list of topics covered in the report, and students who write an abstract have to practice discretion: what must they include? what can they exclude? Since the abstract should be brief, they have to edit carefully. Since it should be coherent, they need to work on paragraphing, a most troublesome requirement for them here. After some practice, they can write abstracts like this:

> This report identifies pH levels and phosphate levels of soil growing corn seedlings for eleven days. The soil was fertilized by monocalcium phosphate, but one plot was also treated with nitrous oxide. This report discusses reasons for the decreased phosphate levels in the oxidized plot.

A conclusion drawn from the same kernel sentences can force students to reconnize differences between it and the abstract. The following combination presents the investigative results specifically and in diminishing order of importance.

> This report on the pH and phosphate levels of soils growing corn seedlings reveals the following:
>
> 1. The phosphate levels of the soil treated by nitrous oxide was less than the level of the untreated plot.
> 2. Nitrous oxide increased corn seedlings' root growth. These roots rapidly absorb phosphate.
> 3. The pH levels of both plots were 4.6.

Again, this is not the only possible order of information (since order depends on audience) or organization of a conclusion; students can increase their available writing options by sharing and comparing their own variations.

Exercises like these demonstrate that sentence combining can work effectively within a technical writing course. Using the language and structures of the technical disciplines, we can create material that will speak to our students' interests. More important, because it demonstrates and inculcates principles of analysis and revision, sentence combining can show our students how to become writers who communicate intended meanings to intended readers--in a "technical style" they have defined (and refined) through use.

## NOTES

[1]Donald Daiker, Andrew Kerek, Max Morenberg, The Writer's Options (New York, Harper and Row, 1979).

[2]Francis Christensen and Bonniejean Christensen, A New Rhetoric (New York, Harper and Row, 1976), 142-164. An additional benefit of this system is that it lets students see where to expand points: a paragraph with a series of only level 2 details, for instance, might suggest superficiality and invite further development.

Panel H-8

# Perspectives on Audience Awareness in Technical Communication

# TEACHING AUDIENCE ANALYSIS TO THE TECHNICAL STUDENT

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## SUMMARY

Recent research and publications have supported the significant role that audience plays, both in delineating the composition model and in defining particular types of discourse. Audience analysis is an inherent and essential component of technical communication. In this paper, we discuss several techniques for teaching audience analysis that have proven successful in a course for engineering students.

## INTRODUCTION

Cicero - an early proponent of audience analysis - suggested that an introduction should render the audience attentive, receptive, and docile. Rather than rendering the audience docile, we choose to rile a little.

We begin by admitting that sometimes (only sometimes) we feel sorry for students. On the one hand, we ask them to write better - and we measure that "better" by the syntactic maturity of their writing - the length of their T-units and the extent of their vocabularies. On the other hand, we ask them to write better, and we measure that "better" by the readability of their writing - using measures that reward short sentences and words of few syllables.[1] For the student who endures in writing, this must be confusing.

By the same token, some of us teach audience awareness, some of us teach audience analysis or audience adaptation or reader accommodation - or we teach no audience at all. This too might be confusing.

Recent research and publications by Miller, Kinneavy, and Flower and Hayes, and others have supported the significant role that audience plays, both in delineating the composition model and in defining particular types of discourse.[2] An awareness of audience is - or should be - an inherent component of any communication situation. In the field of technical communication, the study of audience has evolved into a kind of specialization - a specialization which is becoming increasingly abstracted from its roots and its purpose.

At this point, it is important to note that audience analysis and audience awareness are not synonymous nor equivalent terms, although many people tend to use them as such. Being aware of an audience is necessary for any kind of writing that can be called transactional. Audience analysis is the task of defining who is the audience for a particular piece of writing and determining those characteristics of the audience which will constrain the writer and affect the reception of the message. When an engineer writes a letter, he is aware of an audience because he is writing the letter to be read. When he writes that letter directly to his boss, he is aware of a particular audience. When he begins to think of his boss's reaction to the letter, her frame of reference, her preference for arrangement, her predisposition to the subject, the engineer is engaging in the process of audience analysis. That analysis certainly ensures audience awareness, and when it becomes part of that awareness, it establishes further constraints on the writing - affecting choice of organization, invention, style, revision, and format presentation throughout the writing process.

Much of the current literature on the composing process suggests that an awareness of audience may be one of several possible valid distinctions between the "unskilled" and the "skilled" writer. According to Nystrand, for example, learning to write may be seen as an experiment in which the writer "inquires less into the nature of the topic and more into the nature of the reader's reactions to marks on a page."[3] We suspect that for the experienced writer a large portion of the time spent in recursive activity in writing is focused on incorporating audience analysis. Shaughnessy, Kroll, Britton and others indicate that this is not the case for the student writer.[4] While the experienced writer capitalizes on the internalization of audience, the student writers usually does not, nor do they have the experience, understanding, or tools to do so. The inexperienced professional or technical writer may also find it difficult to internalize an appropriate audience for any given situation.

## DEVELOPMENT OF TECHNIQUES

In 1976, Triton College designed a course which combined an introduction to engineering course and a freshman rhetoric course. Students are introduced to both the engineering profession and its communication techniques. Since that time, the course has been team-taught by an engineering instructor and an English instructor. Subsequently, many of these techniques were used with seniors enrolled in a Technical and Professional Communications course at R.P.I. Our experience with these students indicates that learning techniques of audience analysis can assist students in achieving a mature style - a style that shows the tension produced when a text is written to be read and understood.

Techniques of audience analysis help the student to internalize an audience, to adopt the role of the reader. If the audience is indeed always a fiction, then analysis provides ways in which the abstract and general concept of audience can be made more concrete. With the tools of audience analysis, students learn to define the rhetorical situation. Rather than facing an assignment as if it were some great guessing game with the odds agin' them, they recognize that certain audiences dictate certain constraints. Students who recognize, for example, that a given technical format is a convention which has evolved because of its appropriateness to the subject, to the audience, and to the purpose, are more likely to use and adapt the formats than be paralyzed by them. For the technical student, the audience is the consumer, and market analysis makes sense in producing even a written product.

This characterizes the way we approached teaching audience analysis. We wanted students to

1. be aware of an audience,
2. analyze the audience, and
3. accommodate the audience.

That objective is the foundation of each assignment in the course. Consequently, we chose not to use a "cookbook" approach. Handing a sheet of paper with questions on age and education and technical background of the audience did not seem to be enough. As we continued working with this concept, however, we were able to employ a number of techniques.

## PROCEDURES

First, we attempt to demonstrate that there is a reader and that the reader always has certain expectations. Many students, for example, have never considered the predictability of the English language. As soon as a writer puts the word "The" on a piece of paper, the writer is restricted as to what word or type of word he can put after. In a similar way, the reader, who has come to rely on predictability for efficient reading, also anticipates a certain type of word to follow. Grammar and usage can also be discussed as part of this predictability. We found that an effective parallel can be drawn between this and the student's interaction with a computer. As a reader, the computer is often demanding and rigid in its expectations; if it does not get what the system is programmed to expect, it will stop and print an error message, in many cases noting that it had received something other than what had been expected.

Secondly, as evaluators, we changed our approach. In a team-taught course, the student must deal with two readers - the expert in content and the expert in writing. For many students, the trick to learning how to write is learning how to write to an English instructor - a frequently maligned, often misunderstood, stereotypical creature who is seen as having little relationship to the real world. In a technical writing course, students should learn immediately that they have an audience of at least two: the defined audience and the English teacher (or critical editor). Every assignment a student writes should be labelled with a defined audience, such as the supervisor, concerned layperson, or an expert in the field. The instructor, practicing a little disassociating, participates in the fiction by responding in a dual role: as the fictive reader (What? This doesn't follow!) and as the expert in writing (The organization here would improve if you used transitions.).

Another way to prove that readers do have expectations and to allow students to discover ways of accommodating readers is simply to turn the class into "real readers." During the semester selections from student writing can be clozed (every fifth word deleted) and distributed to the class. The students then attempt to predict which words would accurately fill in the blanks; these results can then be compared to the original. Instructors should also develop in-class exercises which require students to write a process paper or set of instructions on subjects of equal complexity and expertise. Mini-erector sets, Lincoln logs, and simple processes have been used successfully for this type of exercise. The student writes a description of how to build something; during the next class, the students exchange descriptions and attempt to recreate the original design, deliberately misinterpreting when possible.

Finally, the true complexity of writing to an audience is most accurately established with the technical report assignment. Reader accommodation is especially crucial to a good formal report which addresses a variety of readers who have discrete and, sometimes, conflicting concerns. An engineer's report may address peers; project supervisors; sales, manufacturing, accounting, and management divisions; experts and laypersons. The writer must analyze which sections will interest which readers and then strike a balance in the writing among the various readers. For this assignment, we require that students

1. Identify all potential or significant readers;
2. Determine their positions and attitudes relative to the writer;
3. Decide the effects the sections of the report should have on each audience;

4. Choose (and make a case for) specific strategies and appeals.

This process is repeated for the oral presentations.

## CONCLUSIONS

When we think of audience analysis, we typically think of the type of analysis that considers the audience's technical knowledge, education level, reading level, interest, and motivation. These are useful bits of information only in so far as they help to make the audience seem more concrete and as they can be translated into specific techniques and approaches within the writing. From this knowledge, students can extract the necessary information to effectively communicate with the audience.

Earlier we mentioned that audience analysis has become a specialization abstracted from its roots and its purpose. As teachers of the technical student, we need to ensure that analysis contributes to the writing process - and does not reduce it. We need to avoid a tendency to analyze audiences in terms of level, noted by Miller, "as though we are concerned with how tall they have to be to look out of our window."[5]

Finding methods which will truly analyze the relationship between the reader and the writer is not an easy task. The methods are not laid out in any prescriptions, cookbooks, or word processing systems. It is essential, however, for the teacher to recognize that the techniques of audience analysis construct an internalized audience for the student writer, and that the process can be taught, through demonstration, discovery, analogy, and analysis.

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[3]Martin Nystrand, "Using Readability Research to Investigate Writing," Research in the Teaching of English 13, 3, October 1979, p.238.

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[5]Miller, pp. 614-615.

# THE COMPOSING PROCESS OF TECHNICAL WRITERS.

## A PRELIMINARY STUDY.

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Janet Emig's 1971 study, The Composing Processes of Twelfth Graders, spurred an interest in the writing process: how writers compose rather than simply what they compose. However, a survey of current literature indicates that little has been published on the composing processes of technical writers. Perhaps we have assumed that technical writers compose as other writers do. In order to test this assumption, we conducted the research on which we base this study.

### Assessing the Literature

Our first step was to review the literature on the composing process. This literature examines writers from a diversity of disciplines and does not focus upon students or professionals in the pure or applied sciences. From this review, we delineated three areas of general agreement:

1. The composing process is made up of several stages.

For the purposes of discussion, the composing process may be segmented, although researchers differ on the number and names of these stages. Emig delineated seven: pre-writing (from the awareness of stimuli in the environment to the first words put on paper); planning (a setting of parameters); starting; composing; reformulation (correcting, revising, or rewriting); stopping; contemplating the product.(1) However, a simpler model designed by Gordon Rohman is more commonly used: pre-writing, writing, and re-writing.(2)

2. The composing process is reflexive.

Though the writing process may be segmented for discussion purposes, it is in fact reflexive and non-linear. That is, the stages overlap, and may occur and recur at any point. Both Sondra Perl (3) and Sharon Pianko (4) have documented these facts in their studies of writers at the college level. Perl (5) has termed this reflexivity "shuttling," where the writer works backward as well as forward, returning to "substrands" of the writing process in order to compose additional material. Nancy Sommers (6) has also stressed the non-linearity of the composing process in her studies of revision: rewriting can and does occur at any point in the writing process.

3. The composing process may be mastered by means of strategies.

Experienced writers have a range of techniques, or strategies, to assist them in planning, writing and revising their rough drafts. Therefore, their composing processes are well-developed and effective. Sharon Crowley (7) has stressed this latter fact in her comparison of inexperienced and experienced writers. Inexperienced writers do not pre-plan; they also tend to write their products straight through and revise little beyond changes in mechanics. Experienced writers, on the other hand, have well-defined composing processes.

In their studies of problem-solving, Linda Flower and John Hayes (8) have concentrated specifically on writers' strategies, which provide alternative discovery procedures to the trial-and-error methods inexperienced writers frequently use. Flower and Hayes have discovered that good writers constantly redefine their audience and assignment while composing. They also consider their goals, how they wish to affect this audience. Flower (9) has then delineated techniques which these successful writers use to "solve" the problem of composing.

## Collecting the Data

Our second step was to collect data on the way technical writers compose, and relate our findings to these three areas of agreement. We used questionnaires and interviews to gather information from a broad sample, surveying seventy writers in all: technical writing students, students working part-time in industry, university professors, and engineers and researchers working full-time in industry. The disciplines represented by these seventy writers included civil, chemical, agricultural, geological, mechanical, electrical and petroleum engineering, chemistry, hydrology, geology and biology. The writers working full or part-time in industry were employed by firms producing hardware, firms performing consulting services and firms performing research. No technical editors or professional writers were surveyed, only technicians, engineers, and researchers whose jobs involved composing reports.

## Interpreting the Results

Our third step was to interpret the results of our survey in terms of the areas of agreement delineated above.

1. The Composing Process is Made Up of Several Stages.

Our study shows that the technical writer does have a composing process of several stages, similar to that of other writers.

We have used Rohman's model to discuss these stages: pre-writing, writing, re-writing. Of the technical writers surveyed, all seventy indicated that they engaged in some form of distinctly pre-writing and re-writing activity, in addition to their writing stages. The amount of time spent in all three stages and their distinct separation varied greatly, however, and depended on two factors: the projected length of the document being written and the form of that document.

If the writer knew that the final product would be long, ten pages or more, he or she spent more time on pre-writing and re-writing activities and separated the stages of the composing process more distinctly. On the other hand, if the writer knew that the final product would be short, he or she spent less time on the stages and also distinguished among them less sharply.

For example, one experienced writer said that, when composing a short letter, he often thought for a minute or two, mentally noting the main points to be covered and perhaps "came up" with a full sentence to be used in the draft. His pre-writing stage, then, was very brief and tended to merge with the writing itself. After composing the letter, his re-writing activity consisted only of reading through the secretary's typed draft. When preparing a lengthy proposal, however, this same writer had pre-writing and re-writing stages which were divided into several sub-stages and were clearly separated from composing the first draft of the document.

The second factor, form, particularly affected the length of the pre-writing and re-writing stages. If the form were flexible (e.g., the journal article or the proposal), more activity took place in these stages. If the form were highly structured (e.g., the progress report), less activity took place.

2. The Composing Process is Reflexive.

The composing process of technical writers is reflexive and non-linear, as is that of other writers. We found several indications of this reflexivity.

First, as Emig (10) has discussed for others, the writing stage itself is a time of generation for technical writers too. Virtually all writers surveyed indicated that they frequently discovered and added information while composing--content which they had not intended to use and perhaps had not fully articulated. In fact, one chemical engineering professor said he always wrote the conclusion section of a paper or journal article last because he was never sure until he had composed other sections precisely what he wished to conclude, despite finishing his technical work and constructing extensive pre-writing plans. This generative aspect of the writing stage, which involved selecting content and setting parameters for the product--traditionally two pre-writing activities--illustrates the reflexive nature of the composing process: pre-writing acts recur in the writing stage.

Second, pre-writing plans reappear as criteria guiding the re-writing stage. The seventy writers surveyed all performed traditional revisionary activities of adding, rearranging, substituting and deleting material, both during and after composing. Their criteria in terms of content were completeness and proper emphasis of the data, and their procedure was most often a testing process where the writer compared the information included in the draft with the needs of the audience and the purpose of the document. Audience and purpose, as we will discuss, are two primary considerations in the pre-writing stage, which reappear as aids in re-writing.

In addition, all seventy writers said they examined their drafts for logical progression. When checking for logical progression, only a few writers said they referred directly to ordering techniques, another primary component of the pre-writing stage. However, this examining activity itself indicates the internalization of those ordering techniques and another recurrence of pre-writing aids as criteria for re-writing. Thus these writers engage in the process Perl has called "shuttling," again an indication of reflexivity in composing.

Third, writing and re-writing merge with editing, which also ends the writing process. For most writers surveyed, the re-writing of long documents in particular had several sub-stages: the document was examined as a whole and revised; it was examined section by section or paragraph by paragraph and revised; it was examined sentence by sentence and revised. These actions, however, could occur at any point in the composing process. For example, one writer said he frequently reread a previous paragraph or even the entire piece he had composed to date before continuing to write. He then added, reordered, substituted and deleted material and performed editorial operations while composing; his first draft was frequently his last. This merging of writing, re-writing and editing again reveals the reflexive nature of the composing process.

However, editing also ends that process. Although the writers surveyed did not clearly delineate the content or the succession of the sub-stages involved in re-writing, most indicated that they corrected grammar and usage in the sentence-by-sentence reading.

3. The Composing Process May be Mastered by Means of Strategies.

Our survey indicates that the most experienced technical writers have a range of strategies which they use at each stage in the composing process, to help them master writing.

**Pre-Writing.** We have classified strategies used in the pre-writing stage into two groups: first-order and second-order. First-order strategies apply to composing in general, regardless of the specific communication situation giving rise to the document. These first-order strategies include analyzing the audience, analyzing the purpose of the document, and consulting the "classic" forms of technical writing. Second-order strategies apply to the "classic" form once it has been chosen, and include the use of an ordering device to structure the material.

Only the least experienced writers did not reflect on who would read the document and what its purpose was before beginning to compose. The most experienced writers considered these questions, as well as the form they would select. This first-order strategy, however, was frequently implied rather than consciously articulated. For example, writers would discuss the major and minor emphases of a document or refer to the "parts" they intended to include in a specific report, indicating in this way a consideration of form.

All seventy writers except one used some type of written technique to order the material they had gathered for their communication tasks. For most, this written technique was an outline though the degree of formality and complexity varied. For example, the most experienced writers began by listing ideas for inclusion in the draft, after which they sought logical relationships among items in the lists and shaped them into more formal outlines. Virtually all the writers said they then used these outlines as guides in the writing stage. In fact, one interviewee's outline was often so complete he would simply write it out in continuous sentences as his rough draft.

Writers did not, however, limit themselves to one organizational pattern in this pre-writing stage. Instead they often considered several patterns before deciding on a final form. Two such writers mentioned making three or four different outlines in a given reporting situation, then choosing the most effective among them.

Although the list, expanded to an outline, was the most common ordering device used, writers also mentioned utilizing diagrams when describing systems, or a combination of diagrams and flow charts when describing processes, indicating the form-specific nature of this second-order strategy.

The pre-writing stage we have delineated resembles that described in the literature. However, the technical writer's pre-writing stage does differ from the pre-writing stages of other writers in one significant way: generation of material. Researchers on the composing process frequently emphasize searching for new knowledge (11), "inventing" content (12), or choosing a topic (13) as the writer's first pre-writing step. Thus strategies for invention are important pre-writing aids.

None of our interviewees considered searching for or inventing knowledge or choosing a topic in pre-writing or anywhere else in the composing process. Instead, most viewed pre-writing as a time to select and organize material collected prior to the communication task in their technical inquiry. This difference is probably due to what James Souther has called the "situational" (14) nature of most technical writing, where the writer is assigned a topic or one is dictated by an organizational problem he or she has explored, an exploration which also provides the content for composing.

Because the technical writers interviewed generally do not face the problems of generating content or delineating a specific topic and intent from a broader subject area, their pre-writing stages were more deliberate than that described in the literature. Again, the technical writer's pre-writing steps involve setting parameters for a specific communication task: selecting and ordering content rather than generating it. These activities give the stage its deliberate cast, which is also reflected in the specific strategies used to order: the list and the outline. Technical writers find these strategies useful because of the nature of technical forms, which tend to be more prescriptive than forms used in other writing situations and structured on logical rather than associative or emotional principles.

**Re-Writing.** Strategies used in the re-writing stage are all first-order because they apply regardless of the specific communication situation. This re-writing can and does occur throughout the composing process and proceeds on three levels: content, form and style.

In terms of content, technical writers return to their audience and purpose analyses as checks when revising for inclusiveness and proper emphasis of content.

In terms of form, technical writers tend to revise from larger units to smaller, solving major structural problems before proceeding to the paragraph or sentence level. Logical progression of the draft is the major criterion guiding this revision, which proceeds by checking the actual pre-writing outline or more frequently an internalization of that outline.

In terms of style, technical writers make stylistic changes during composing, often after considering audience needs, but they also edit when the draft is complete.

The re-writing stage we have delineated also tends to be more deliberate than that of other writers described in the literature. The technical writer's audience, purpose and form are set by his or her technical task. The parameters guiding the technical writer's revision are thus more clearly defined than is the case with other writers. The technical writer's major criteria for revision--inclusiveness and proper emphasis of the contents of the draft, and logical progression--can be met because the revisionary task itself is clearer.

## Defining the Implications

The seventy technical writers we surveyed all engage in a composing process similar to that of other writers, with strategies to master it at each point. The differences we found do not concern the process itself, but the deliberate cast or character of the stages and the well-defined nature of the strategies used.

We feel that this information has several important pedagogical implications:

1. Composing as process ought to be taught.

In addition to the data we have presented, we have found that most experienced technical writers understand the nature of composing: the process involved and the steps used. Our students must also understand composing as process if they are to write well.

2. Strategies to master writing ougnt to be delineated.

The successful technical writers we surveyed have a range of writing strategies at their disposal. Our students must also be given these tools, in order to master composing.

3. The distinctive rature of the technical writer's composing process and writing strategies ought to be presented.

Technical composition does differ from composing in other fields, as our study indicates. The composing process is more deliberate and strategies more clearly defined: audience, purpose and form guide planning, writing and revising. The situational nature of writing also influences composing. These distinctions help define the nature of technical writing, and thus they too ought to be taught.

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# HOW EXAMINING PEDAGOGY IN TECHNICAL DISCIPLINES CAN ENHANCE TECHNICAL WRITING INSTRUCTION

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## SUMMARY

Because technical writing courses generally reside in English departments, technical writing teachers often lack perspective concerning students' writing outside English courses. Because teaching methods used by professors in technical disciplines often determine the extent of students' writing development, understanding these methods is a prime need of writing teachers. Working closely with these professors provides the writing instructor with knowledge of their teaching methods while providing opportunities to modify these methods to enhance writing development. Moreover, such interaction enhances the writing teacher's knowledge of technical subject matter. The teacher thus gains credibility in the eyes of both students and faculty with whom he/she works.

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Rising demand for technical writing courses calls upon English departments to offer additional sections, a situation for which most departments are unprepared, being heavy laden with literature specialists. At North Carolina State University, and I suspect elsewhere, continual outside recruitment of experienced technical writing teachers to staff these classes is infeasible, which means teachers having mostly humanities backgrounds and inclinations find themselves preparing to teach technical writing. At North Carolina State, we held a week long workshop to train recruits, offering them a rather intensive overview of methods and materials used by our existing technical writing staff. We now have, as a result, a larger pool of instructors to share ever increasing class loads. Nationwide, in some fashion this process is repeated, either formally or informally; thus the ranks of new technical writing teachers swell.

But in this solution to one problem lies another: faculty with primarily humanities backgrounds often don't know very much about what technical students do in their disciplines. Coming from literary study, from teaching freshman composition or literature survey courses, and from a writing tradition mainly humanities based, these new technical writing teachers usually have limited experience with technical subjects and even less experience with technical and scientific report writing. To teach technical writing courses, they have the guidance provided by excellent literature on the subject. (I refer especially to Cunningham and Estrin's The Teaching of Technical Writing, published by NCTE in 1975.) And they can peruse an array of technical writing textbooks to learn what to require of students. But discovering the types of work science and technical students do and the types of writing that professors require in technical courses demands exploration outside the normal range of an English instructor's experience.

Indications are that such exploration is needed and that when occuring it is highly beneficial. Writing across the curriculum programs evidence the need for two-way information exchange about writing instruction and the setting of clear rhetorical objectives uniformly applied. Terri Paul and Mary Rosner, studying style in agriculture journals, concluded that "we have to learn more about the writing of the professions our students will enter if we want to teach them technical writing." I heartily agree, based on my experiences with forestry and engineering students in programs designed to insert technical writing instruction into their technical courses. Further, I cannot think of a more convenient or necessary place to examine the contexts and particulars of technical writing as it occurs than in the technical courses students take. Between the ideals we and the textbooks teach and the actualities of technical situations, critical differences exist. Some of these differences are never more evident than in the assignments required by technical subject professors and prepared by their students. Biases color professors' expectations, traditions govern their reactions to right and wrong in report writing. Various limitations constrain how writing gets evaluated and what kind of information students receive about their communication--its success or failure and reasons for either. Discovering these characteristics of technical pedagogy, I think, becomes essential if we want to understand how what we teach integrates with writing practice elsewhere in the university and, ultimately, in professional contexts. Obviously such discovery can especially benefit those new recruits lacking the breadth of technical experience to find comfort in their new roles as technical writing teachers.

Initially, and practically, we have to acknowledge the significance of the writing or lack of writing done in technical curricula. Undeniably, the way professors in technical disciplines treat student writing can have greater effect on how students write than do writing courses. Students, after all, spend far more time in technical studies. Usually professorial indifference or concern toward writing induces student indifference or concern. Professors' attitudes can either underline communication's importance to the subject or ignore its role. The more we in English departments know about what occurs in technical courses, how professors treat writing in Forestry 405-406, Electrical Engineering 202, Civil Engineering 342, etc., the better able we will be to enhance students' writing development. In fact, we can begin cooperating with technical faculty in a better unified effort to produce competent professional communicators.

We have to look, I think, at some general practices, examining misconceptions they can engender that we have to counteract as best we can. We should look at the variety of ways professors make assignments and what kinds of skills students must bring to their report writing. We can then examine what concepts and practices students should transfer or modify when they enter writing situations. In addition, we can see several important benefits to us as technical writing teachers in our own classes.

Perhaps the most problematic characteristic of how technical faculty treat student writing has to be inconsistency. Some professors are nigglers harping on what amount to fairly insignificant details of usage, while failing to address the larger issues of organization and coherence. Some professors seem blind to any student writing problems. Some professors labor over students' papers, giving comprehensive comments and spending more time on the paper than the student did. Such inconsistency leads to confusion, with students trying to guess at how much the professor cares rather than working at some consistent level of competence.

Nigglers have pet peeves and place undue emphasis on their own preferences for word choices or subtle points of grammar drilled into them by some past writing teacher. Nigglers, for instance, might know that splitting infinitives is wrong and be able to distinguish between who and whom, but they may be so caught up with such matters that they miss the larger problem of disorganization that plagues the student. Professors blind to student writing problems allow everything to get by, treating the poorly written paper the same or better than the well written paper depending on technical correctness. Such blindness can lead to reliance on formulaic lab report formats that provide technical answers in what amount to fill-in-the-blank exercises, for which students provide numbers, equations, and the like but never have to articulate substantive ideas. Confronted with nigglers on the one hand and the blind professors on the other, students begin to discredit professors' concerns altogether. The conscientious professor who makes accurate and directive comments is perceived as an oddity, someone to be appeased but not really taken seriously.

Inconsistency also extends to who does the paper grading--the professor or graduate assistants. In large classes with multiple lab sections, assistants perform the grading tasks, with or without close professorial supervision. Like professors, graduate students have varied abilities with the language. Because of their second-class status, graduate students may not have or may not assume the authority to make needed rhetorical and grammatical comments, but this is hardly consistent. In fact in my experience, I know of several graduate students, good writers themselves, who provide thorough coverage to writing problems. Unfortunately, however, their authority gets questioned by students who balk at being evaluated for more than technical correctness. At North Carolina State, moreover, where nearly half the engineering graduate assistants are foreign nationals, whose English competence in many cases remains minimal, the problems of grading students' writing quality are extensive, and the arguments that ensue between graders and students can be quite destructive.

Inconsistency can also affect the very styles students are required to present in their writing. Academic styles, the full-blown discourse so often evident in journals and texts might be appealing to one professor and totally wrong for another. How is the student to know except by trial and error? Overall, professors seem to prefer a plain style that says what it has to say without adornment, that supplies the most information with the least fuss. But the degree of simplicity remains hazy, especially when students sense that the simple statement lacks prestige and proper force. In some part, the problem here stems from the types of writing often examined and taught in English composition and literature classes. Significantly, though, students required to read and use technical literature will begin to emulate what they read and, without being told to do otherwise, begin to write, though less successfully, like the published authors. While such a result could be good, more often than not it is bad. I think we have to sound out the technical professors whose students we teach and establish a concensus about what expectations are going to exist.

We should also know more than we do about the types of reports students write for other courses and the types of problems they have to solve to write those reports. Just as inconsistencies among professors can affect students' perceptions of what writing is, the types of reports they prepare will affect their perceptions of how to approach the writing process. They are going to write laboratory reports quite differently from how they write term papers. Without any knowledge or without correct knowledge, we are doomed to act with a set of assumptions based on our own limited experience with scientific and technological processes. I grant that we can provide a valuable service as uninformed readers outside the technical context and thus serve as an audience for whom students must prepare to write. But I think we can serve this function just as well after looking into the nature of the technical problems and more closely than we have at reports that will derive from them. As teachers shaping students' writing experience, I think we have some responsibility for sensing when the material is <u>right</u> technically. More importantly, though, we can better guide students toward correct report procedures when we have a modicum of experience with the technical subject matter. We can ask the significant questions that have to be asked as the student explores the writing process. Further, we can better understand the stages of report compilation that precede the actual drafting. Insights into the land management planning process, for instance, will help us teach forestry students why certain information goes in appendices rather than the body of a management plan, or why transitions in these reports are so essential.

On a more specific level, if we have the practical experience, we can draw attention to the pitfalls that prove most irksome to technical professors. We can highlight the small points that proofreading and careful revision will monitor, so that students will give credence to the impact such errors can have. Understanding some of the terminology and recognizing the symbols used by electrical engineers can help us emphasize the need for accuracy in design project papers. The capital K and lower case k, for example, denote quite different things (Kelvin and kilo respectively) and are not interchangeable. Though we can argue that such details are not the writing teacher's responsibility, being able to note such distinctions makes us decidely better report evaluators. In this regard, we can reinforce or counteract some of the evaluation practices that we know exist outside the rigors of a writing course, making students aware of the consistent and idiosyncratic concerns report readers will have. In general, though we have to make the effort to identify such characteristics by making more frequent contact with technical professors than has generally been the practice. The question, of course, is how.

Writing across the curriculum programs are providing some opportunity, a much needed chance for mutual discussion and learning. At North Carolina State we have established, at the invitation of the Schools of Forestry and Engineering, programs specifically designed to bring writing instruction into technical classrooms as part of normal course activity. A variety of approaches allow us to work closely with faculty members who require written reports. Sitting down with them, we are able to establish mutual expectations and identify the most crucial areas for instruction. In a course I team teach with a forestry professor, we have substantially revised the scope of the land management planning paper students must prepare their last semester. Over the three years we have worked together, our shared experience has led to changes in the way we make the assignment and evaluate the reports. Once submitted as a whole at the end of the semester, the plans are now submitted in parts, to be evaluated and sent back for revisions. Bill and I have learned from each other and have modified our approaches accordingly.

With engineering faculty, workshops and consultations have led to changes in assignment types, our emphasis being on giving students realistic situations, wherein they might be required to submit a construction site evaluation or act as consultants to contractors requiring specific lab analyses of soil samples. Classroom presentations allow us, as writing consultants, to enter the classroom and supplement what the professor has said about a paper assignment with specific information concerning the preferred style in which it should be written. Simultaneously, working with students individually allows us to see the results of our efforts and diagnose the types of problems that need further attention in future presentations. At every turn we are able to examine faculty expectations and make suggestions as to how these expectations might be altered or made clearer.

In our present situation at North Carolina State, we have a fairly formal structure for doing what I am advocating, but I think that any technical writing teacher with the gumption can learn the ropes and explore writing done in the technical disciplines. Paying attention to what students are interested in and asking them what types of writing they have to do elsewhere indicate where to begin an exploration. Following up these probes by informal contacts with technical faculty will fill in the gaps.

The benefits of such explorations are easily discernible when the technical writing teacher puts this newfound knowledge to work. For one thing, credibility in the classroom increases. Students who lose interest in the abstractions of technical writing instruction pay attention if the person up front cites examples that strike close to experience or quotes a particularly well known professor's desires. Students begin to identify the relevance of the message. Then, too, they respond to the teacher who exhibits a real interest in their subject area and who can speak accurately about its intricacies, who at least recognizes the technical terminology and can distinguish it from the jargon. Students greatly appreciate the outsider who can <u>see</u> their problem and can provide a sounding board that helps them find a workable approach to solve it. The teacher who can help them identify the audiences they will need to address does them a real service and can act credibly as that audience when the time for report evaluation comes. In fact, the whole range of teaching activities we engage in the technical writing course will be enhanced by informed teachers who examine methods and problems that exist in the real contexts outside their own courses.

Panel I-6

Rhetoric, Invention and Arrangement

# ANALOGICAL ACTS AS CONCEPTUAL STRATEGIES IN SCIENCE, ENGINEERING AND THE HUMANITIES

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ABSTRACT:

Analogies are used implicitly or explicitly as heuristic procedures for exploring problems, formulating hypotheses, and generating discourse in the arts and the sciences. All of the problem-solving strategies that are commonly used across the disciplines are conceptual models or constructs which operate by means of analogy. By understanding and teaching the problem-solving strategies common to rhetoric and communication courses and by encouraging our students to use the problem-solving strategies that they learn in their own disciplines as heuristic probes to generate the content of their discourse, we can teach them transfer skills while forging an important theoretical link between the conceptual strategies and theoretical models used in the pure and applied sciences, the humanities and composition theory. The purpose of this paper is to identify the composing models which operate by means of analogy, to discuss the importance of analogical acts in the prewriting stage of the composing process, and to explore the relations between analogical acts and concept formation.

## ANALOGICAL ACTS AS CONCEPTUAL STRATEGIES

> Writing serves learning uniquely because writing as process-and-product possesses a cluster of attributes that correspond uniquely to certain powerful learning strategies.
>
> --Janet Emig

As teachers and communicators, we all use analogic forms as aids in solving problems and in processing data. Proportional analogies, figurative analogies, archetypes, constructs, metaphors, similes and physical, theoretical and interpretative models are all examples of analogic forms.[1] These forms help us to discover and to communicate what we know effectively and economically to others. A prime reason for the effectiveness of analogic forms as conceptual strategies is that they demand an active--or better yet, interactive--response from the audience. Just as the writer discovers the analogic relations between the subject under investigation and the analogy used to explore it, the audience must rediscover these relations. Our initial cognitive response to a novel analogy is a "synthetic" or "holistic" one: It consists of a novel act of recognition or an illuminating perception of similarity between the analogues. After this initial act of recognition, we call upon our analytical skills to "unpack" the meaning of the analogy and to determine if what initially rang true for us will indeed withstand closer scrutiny. To a degree, this shift from synthesis to analysis and back again is a matter of foregrounding and backgrounding. W. H. Leatherdale describes this process in The Role of Analogy, Model and Metaphor in Science when he states that sometimes one and sometimes another of the analogic relations is brought into focus or juxtaposed with this or that other relation: ". . . sometimes crystallizing out only to dissolve again under the pressure of discordant facts drawn from other areas. . . ."[2]

Our higher level cognitive skills of synthesis and analysis are called into play when we read the following ad that an elite women's apparel shop placed in the St. Paul Chamber Orchestra's program notes: "As Bach is to the fugue; as Mozart is to the divestimento; as Beethoven is to the symphony; so is Peck & Peck to women's clothing. Classical." The relationships set up by this proportional analogy suggest a sense of style, quality and an ambience which go far beyond stating that Peck & Peck specializes in classical clothing for women.[3]

Besides using analogic forms as persuasive and heuristic strategies in advertising, creative analogies serve a very practical informative function in science and engineering. Scientists have long used analogic forms such as the solar system model of atomic structure and the billiard ball model of gas molecules to guide their research and to serve as pedagogical tools. Electrical engineers have also borrowed the language and concepts from a familiar area of knowledge to explore the unfamiliar when they use the language of hydraulics (i.e., the pressure and flow of liquids) to explain voltage and amperage. As these examples illustrate, one of the primary uses of analogic forms for problem-solvers and communicators is to help them to grasp difficult concepts easily by using the familiar as a probe to explore the unknown. Since the analogy that we "import" from a different, more familiar domain to explore the unknown has its laws and properties already well worked out, it provides us with a useful set of categories and attributes that can be used systematically to investigate the subject or problem under consideration. Considering the value of analogic forms as conceptual strategies and discovery procedures, the purpose of this paper is to answer two questions concerning the function of analogic forms: (1) How does the use of analogic forms across the disciplines compare with our use of analogy in teaching composition? and (2) What is the relationship between analogical thinking and learning in general?

II

Any history of thought might begin and end with
the statement that man is an analogical animal.
--S. Buchanan

Analogic forms serve the same descriptive, explanatory and predictive functions in composing that they do in other disciplines. The analogic forms we use in composing help us to arrange informa' 'on into meaningful patterns and help us to generate or invent the cc tent of discourse. Whenever we use or teach structural or invent. 'al heuristics, we are using analogic forms. In this section of paper, we will identify thr analogic forms we use in teach writing and explore how they function in generating discourse.

The composing strategies or heuristic procedures that we teach in composition classroom operate analogically, that is, they set up an analogical rather than a logical relationship between the composing strategy and the resulting discourse. There are two basic types of composing strategies that we teach: (1) structural models, which function primarily to generate the form of discourse, and (2) inventional models, which are used to generate the content of discourse.[4]

## Structural Models

Teachers of journalism and technical and professional writing rely very heavily on structural models. These models usually consist of formats or outlines identifying the parts of a discourse and indicating how to sequence the information. Different structural models are used for generating the arrangement patterns for different types of discourse such as the inverted pyramid model for arranging news articles or the causal analysis format for arranging the discussion in troubleshooting reports. Other structural models would include formats for proposals, progress reports and technical memoranda, various types of business correspondence and technical articles. The primary function of structural models is to aid writers in organizing raw data into particular types of written communication. We could schematize the application of structural models to raw data in the following way:

| | | | | |
|---|---|---|---|---|
| Topic or Problem (raw data) | + | Structural Model (to select, deselect and arange data) | → | Discourse |
| i.e., mass of data resulting from a technical investigation | + | structural outline for a technical memorandum | → | the actual technical memorandum |

In the case of structural models, the analogic form they illustrate is the direct, proportional analogy. The proportional analogy identifies and explains the formal or structural similarities between the model and the discourse. Since these similarities can be inferred from direct sense experience or from ordinary perception, the structural models make use of what philosophers call "first order properties of direct relation"[5] and set up almost a 1:1 relationship between the model and the discourse. An example of a structural model in science which operates via a proportional analogy is wing : bird :: fin : fish. The relations between the bird's wing and the fish's fin can be easily determined by examining the form and function of these anatomical parts. In composition models, however, the similarities between the structural model and the discourse are even more flexible. When we analyze the discourse into its component parts, the structural model used to generate it becomes apparent. The "purpose statement model" and the following purpose statement taken from Mathes and Stevenson's Designing Technical Reports[6] serve to illustrate the analogical relations between structural models and the discourse:

| Purpose Statement Model | Discourse |
|---|---|
| 1. Problem and context | Symmetrically spiraled curves accommodate the natural driving path of the motorist. When properly designed, these curves produce a more comfortable and safer ride. However, engineers have hesitated to use these curves because of the difficulty in |
| 2. Assignment or technical tasks | calculating them. Consequently, the symmetrically spiraled curve program was designed and written to quickly compute |
| 3. Rhetorical purpose | the basic characteristics of the curve. This memo explains how to arrange the necessary data on computer cards so that highway engineers can use the symmetrically spiraled curve program to design a curve (p. 26). |

By comparing the model with the sample discourse, we find that the structural model sets up a functional relationship with the discourse. The model describes and explains the arrangement of the information by outlining the component parts of an effective purpose statement. To evaluate a purpose statement that has been previously written or to generate a new statement, we can use the model as a guide and checklist. Used as a guide, the model serves a predictive function, predicting the form of other successful purpose statements.

Since we are dealing with direct relations between the parts of the model and the discourse under consideration, we are easily tempted to teach structural models prescriptively. However, the model is a theoretical construct and its relations to the discourse are analogous rather than logical. Because they posit analogous relations with the discourse, the structural models can only be considered guides to reason or suggested arrangement patterns. In other words, they provide us with heuristic procedures rather than with algorithms.

## Inventional Models

Inventional models also operate by means of analogy, but the analogical relations posited here are <u>resemblances</u> of relations rather than direct relations of first order properties. Some inventional models, like Rohman and Wlecke's prewriting models, instruct the writer to invent his or her own "suitable analogies" for exploring a problem or topic.[7] In other instances, the writer is presented with specific generative analogies such as the particle-wave-field analogy (drawn from physics) used in tagmemic invention or the dramatistic analogy used in Burke's Pentad.[8] The writer is then instructed to apply these creative analogies as <u>perspectives</u> for exploring problems and for generating the content of discourse.

Most inventional models operate by means of esoteric and creative analogies imported from another domain of our experience. These creative analogies must have, as it were, "a life of their own," independent from those properties we are using them to explain. When we employ creative analogies to invent discourse, we import both the analogy and all of its associations from that other domain. The impo[illegible] analogy together with its complex system of associations provides us [illegible] a familiar set of categories and assumptions that we can use as perspectives to aid us in exploring, describing and explaining the "topic analogue," or problem under investigation. We could schematize the application of inventional models to a problem under investigation in the following way:

| | | |
|---|---|---|
| Topic or Problem for investigation | + | Inventional Model (to stimulate memory, imagination and intuition by discovering positive, negative and questionable analogous relations) |

↓

Raw Data, Novel Insights, Unique perspectives + Structural Models (to select, deselect and arrange data) → Discourse

As this process diagram illustrates, the inventional models are employed prior to and at a different level than the structural models. Instead of setting up a proportional relationship between the model and the discourse (as the structural models do), the inventional models are another step removed. The relationship they set up with the discourse is more abstract and esoteric. The inventional models establish a direct relationship with the writer's cognitive processes (i.e., with his perceptual skills, problem-solving skills, learning skills and verbal skills). In this way, the inventional models guide reason and stimulate intuition to aid the writer in discovering the content of discourse.

To explain the relationship between the inventional models and the writer's cognitive processes, we must explore the process of analogical thinking itself. When the writer applies an inventional model (or creative analogy) to a topic analogue, he is performing what Leatherdale calls an "analogical act."[9] An analogical act consists of a novel act of recognition followed by an examination of the features and properties of the topic under investigation from the perspective of similar features in the inventional model. The analogous relations between these two sets of features can be classified as "positive," "negative" or questionable ("neutral") analogues.[10] The following diagram depicts what occurs during analogical thinking:

| | | | | |
|---|---|---|---|---|
| Topic or Problem under investigation | + | Inventional Model | --> | Analogical Act (recognition of novel similarities leading to positive, negative and neutral analogues) |
| i.e., (atomic structure) | + | (solar system model) | --> | |

We can explain this process by describing what occurred when Niels Bohr discovered the structural similarities between solar systems and atoms. Bohr used what he already knew about the structure of the solar system as an analogy for relating the isolated facts and speculation then current about the atom. Since the properties of the solar system were directly observable, well worked out and easy to extend and generalize about, he used them as an imported analogy to make the strange and unknown familiar. After his initial illuminating perception of the similarity in structure between solar systems and atoms, Bohr had to work out the implications of these resemblances by identifying and analyzing the positive, negative and neutral analogues generated by this analogical act. When he compared, for example, the solar system's large central sun orbited by planets with the atom's large nucleus orbited by electrons, he identified a positive analogue. The discrepancies in size and physical composition between the solar system and the atom were identified as negative analogues--or areas where the analogy breaks down. Useful creative analogies should enable the investigator not only to identify and explain obvious positive and negative analogues, but also to predict novel similarities based on properties or relations that he has not yet used or that were less apparent initially.

The prediction of new relations, suggested by the imported analogy attest to the heuristic value of the model. For example, since Bohr knew that there is a force called gravity holding the planets in their orbits around the sun, he was led to postulate an analogous force (electrical charges) holding electrons in their orbits around the nucleus.

Such novel prediction, based on the known properties of the model serve as heuristic probes to guide research systematically, rather than haphazardly. The postulated relations are considered "neutral analogues" until, after testing and verification, they can be included as part of either the positive or negative analogues. The usefulness of the inventional model as a conceptual strategy for extending knowledge and discovering new knowledge can be evaluated by the quality of its predictive power or its ability to guide research successfully over time.

Although our discussion of the solar system model of atomic structure is far from complete, it has illustrated that inventional models, operating by means of creative analogies, systematically direct the writer's problem exploration by providing unique perspectives on the problem. The model helps the writer to generate useful data by identifying positive and negative analogues. The questionable or neutral analogues resulting from analogical thinking can aid the writer in forming preliminary hypotheses. As the solar system model demonstrates, the epistemic value of the model is often found in its neutral analogues: while the positive and negative analogues extend our knowledge about the problem, the neutral analogues raise questions which may lead to the discovery of new knowledge. The raw data, novel insights and unique perspectives generated by applying inventional models to puzzling problems enable writers to discover features properties and relations which reformulate their knowledge about the world. Both the structural and the inventional models, therefore, serve as conceptual strategies in problem-solving and communication situations. The question remaining to be answered is: How does the analogical thinking which occurs whenever we apply composing models relate to concept formation and to learning in general?

III

> As philosophy grows more abstract, we think increasingly by means of metaphors that we profess not to be relying on.
> --I. A. Richards

Janet Emig argues brilliantly in "Writing as a Mode of Learning" that writing is a unique mode of learning because of its unique and immediate form of feedback and reinforcement. The information from the process of writing". . . is immediately and visibly available as that portion of the product already written. The importance for learning of a product in a familiar and available medium for immediate, literal (that is, visual) re-scanning and review cannot . . . be overstated." 11 Emig concludes by stating that the process and product of writing share many features with successful learning strategies, and she proceeds to enumerate four of these shared features in her article. Our discussion of the function of composing models in teaching writing and the relationship of these models to cognitive strategies identifies yet another correspondence between writing and learning: the use of analogical thinking as a cognitive strategy for discovering knowledge.

In more poetic terms, Nietzsche recognized the relationship of analogical thinking to discovering knowledge when he described the acquisition of language as a metaphoric (or analogic) process:

> A nerve stimulus, first transformed into a percept! First metaphor! The percept again copied into a sound! Second metaphor! And each time he (man) leaps completely out of one sphere right into the midst of an entirely different one. . . . What therefore is truth? A mobile army of metaphors, metonymies, anthropomorphisms: in short a sum of human relations which became poetically and rhetorically intensified, metamorphosed, adorned, and after long usage seem to a nation fixed, canonic and binding; truths are illusions of which one has forgotten that they are illusions; worn out metaphors which have become powerless to affect the senses; coins which have their obverse effaced and now are no longer of account as coins but merely as metal.[12]

Nietzsche's analysis of the relationship of language to knowledge (truth) leads us to a view of man as an "analogical animal." Man does not deal with ultimate reality--the Thing-in-Itself. "The Thing-in-Itself (pure truth, according to Nietzsche) is . . . quite incomprehensible to the creator of language and not worth making any great endeavor to obtain. He designates only the relations of things to men and for their expression he calls to his help the most daring metaphors."[13] Nietzsche agrees, then, that we are incapable of perceiving Reality. Instead, we create in our minds our own realities, as best we can, based on our capacities to receive and process sensory data and our perceptions concerning that data. In this way, we invent our own realities.

The process of inventing reality is aided by analogical thinking at a very basic level of cognition. When we are faced with a totally new problem or situation, our minds do not know how to recognize or explore the unknown because we have no pre-programmed classification system by which to organize our perceptions. Our ability to perceive something is a learned ability, and we come to recognize and understand the unknown by comparing it to knowledge patterns with which we are already familiar. This search for resemblances between the unknown and the familiar is the crux of all analogical thinking. The pre-programmed or familiar models or procedures which we apply to unknowns in life enable us to discover classification systems to order the positive, negative and neutral analogues between a topic analogue (or problem) and the imported analogy and to make them intelligible. There is a basic correspondence, then, between the analogical thinking employed in successful learning and analogical thinking as a composing strategy.

The importance of analogical thinking to composition and communication stems from its heuristic and epistemic attributes. To explain the epistemic function of analogical thinking, we must understand the memory and logic functions of the brain. The memory function stores information that has been selectively received and selectively translated with structure, meaning and value added to it. The logic function, on the other hand, compares incoming data to stored information and uses this comparison as a basis for determining how to interpret and respond to new data. We can only evaluate new ideas or opinions by comparing them with the ideas and opinions we already have. The more ideas and opinions we become familiar with, the greater is our basis for comparison and for understanding even more. Literally, learning increases our ability to learn more.[14]

The sensory stimulation that we note and respond to becomes processed information. As we evaluate this processed information, we send ourselves internal feedback. It is by the process of getting internal and external feedback on already processed information that we learn. In writing, also, as Emig maintains, the unique and immediate processing of feedback from the portion of the product completed leads to a unique form of learning.

Analogical thinking, operating as part of the "logic" function of the brain, enables us to compare problematic data and unknowns to stored information and to use this comparison as a basis for determining how to interpret and to respond to new data. We could summarize the role of analogical thinking in concept formation and, correspondingly, in the composing process, by noting that analogical thinking involves the perception of novel insights and resemblances. The classification and systematic exploration of these insights, guided by the structure of the imported analogy, brings our problem-solving skills to bear on the data. As we process both internal and external feedback that we get from comparing the unknown with the familiar stored information, we learn. When we attempt to communicate what we have learned in the process, we also involve our verbal skills. To communicate our perceptions, we sometimes even borrow the language of the imported analogy (such as hydraulics) to talk about the topic analogue (electricity) until we either create a new set of terms and concepts (like voltage and amperage) to represent our new knowledge or until we extend the meaning of the old terms (pressure and flow). Therefore, by teaching analogical acts as conceptual strategies for exploring problems and generating the form and content of discourse, we are forging another link between learning and writing to support our contention that writing is a unique mode of learning.

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[1]A more complete listing of analogic forms and a useful discussion of analogy is presented in James R. Wilcox and Henry L. Eubank, "Analogy for Rhetors," Philosophy and Rhetoric, 12, no. 1 (Winter 1979), 1-20.

[2]W. H. Leatherdale, The Role of Analogy, Model and Metaphor in Science (Amsterdam: North-Holland Publishing Co., 1974), p. 15.

[3]For a discussion of the heuristic value of analogy, see Wilcox and Eubank.

[4]The form/content division between these two basic types of models is not entirely clear-cut. A case could be made for inventional models serving somewhat of an arrangement function in certain cases and for structural models serving as guides and checklists thereby helping the writer discover the content.

[5]For a discussion of these properties, refer to Mary Hesse, Models and Analogies in Science (Notre Dame, IN: Univ. of Notre Dame Press, 1970).

[6](Indianapolis: Bobbs-Merrill, 1976), p. 26.

[7]D. Gordon Rohman and Albert O. Wlecke, Pre-writing: The Construction and Application of Models for Concept Formation in Writing (ERIC: ED 001 273).

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[9]Leatherdale, p. 15.

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[12]Friedrich Nietzsche, "On Truth and Falsity in their Extramoral Sense," in Essays on Metaphor, ed. Warren Shibles (Whitewater, WI: The Language Press, 1972), p. 4.

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Panel I-10

# Approaches to Teaching Technical Communication

# LITERATURE AND THE TEACHING OF TECHNICAL WRITING

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As the number of sections of technical writing increases at both two-year and four-year colleges and universities, more teachers originally trained to teach literature must prepare to teach technical writing. For nearly a decade the Association of Teachers of Technical Writing has given high priority to this preparation of new teachers, and John A. Walter, upon completing his tenure as president of the Association, asserted that "helping conventionally trained teachers of English make the transition to becoming teachers of technical writing" must be given priority in the decade to come. (ref. 1)

It has been suggested from time to time that literature, especially the surface features of poetry, can be used to illustrate the principles of good technical writing. A noted technical writer, perhaps building on the commonplace assertion that whoever can read poetry well aloud can write a good technical report, remarks that "we can learn much from poetry--short words and short sentences. Some people say that technical writing is too jerky with short sentences. Look at poetry. It's not jerky." (ref. 2) A recent essay explains how a teacher can use William Carlos Williams' "The Red Wheelbarrow" to demonstrate that purpose governs choice of words and, conversely, that language must be adapted to purpose. (ref. 3) And of course there is John S. Harris' minor classic, "Metaphor in Technical Writing." In this article Professor Harris notes that metaphor is peculiar not just to poetry but to language itself, concluding that all language is by nature metaphorical and thus poetical. (ref. 4) By and large, though, Harris' line of thought remains undeveloped and references to poetry and metaphor in the teaching of technical writing remain scattered and unsystematic. The conventionally trained English teacher preparing to teach technical writing for the first time is apt to conclude from the literature on the subject that what Robert Frost somewhere called a "proper poetical education" is only slightly and superficially useful in this new endeavor.

Other factors impel the new teacher to this conclusion. Faced with students who use unfamiliar facts and concepts and who write papers full of formidable-looking graphs, charts, tables, equations, diagrams, and terminology, the new teacher is scarcely at leisure to contemplate or speculate upon the relationships between literature and the various types of technical papers and reports. Such a teacher, psychologically on the defensive, can be forgiven for deciding without conscious ratiocination that the high ground of literary training must be abandoned in favor of some safe bunker. Yet this _is_ the wrong decision because it does not explore the ways in which previously acquired literary training prepares one to teach technical writing--as it certainly does. It forgets that what great authors have said about writing can be of value to students of science and technology. It ignores the demonstrable similarity between the act of creating a poem and the act of creating a good report. It also ignores the fact that scientific and technical people have remarked on this similarity--and used essentially poetic processes in their discoveries. In short, it postulates an adversary relationship where in fact there exists a common bond.

The idea is pervasive that, whereas literature addresses matters of imagination, science and technology address matters of fact. Closely allied with this concept of fact is the term most often used with reference to sense, a hallmark of scientific method. Moreover, objectivity is cited often by humanists in both its favorable and pejorative senses. Thus the new teacher of technical writing should reconsider this concept of fact from his vantage point as a language specialist. It is significant that the concept of fact, in its common sense of "verifiable and reproducible datum of experience," did not originate, according to the _Oxford English Dictionary_, until the seventeenth century. That is, before the seventeenth century there was no term to describe data that is defined without reference to readers or hearers. Then, of course, as now, a person could observe impartially, but the concept of depersonalized reporting of events as if they had occurred in a vacuum was simply unthinkable. No value could have been attached to it and no need imagined for it.

One might ask whether the concept lurks behind some other words. The answer seems to be "no." Written annals preserving records haphazardly for posterity were subsumed under the rubric "received material." History, now often defined as a concatenation of facts, as "objective," was then conceived of as a narration valuable not for fidelity to fact (there was no such concept) but rather for its power to teach readers and hearers by examply how to live well. William Caxton, for instance, told readers of his edition of Ranulph Higden's universal history or _Polychronicon_ (1482) that

> History may be described thus. History is the perpetual conservatrice and also cotidian witness of good deeds, bad deeds, great acts, and triumphal victories of all manner of people.

He contrasts history with "the feigned fables of the poets" and illustrates history by referring to the actions of Hercules. (ref. 5) Elsewhere, in his

241

Jason (1477), he cites the actions of Saturn, Jupiter, Titan, and Perseus for the same reason. Caxton followed the usage of his age, then, not only in emphasizing the moral dimension of history but also in blurring the distinctions, already faint, between history and story, between what moderns call fact and fiction. His reference to his own Recuyell of the Histories of Troy (1474) as a "history" made up of "stories" anticipates a statement like William Painter's that even the most lurid "stories" in that Elizabethan best-seller, The Palace of Pleasure (1566), are "histories" that include both good and bad actions so that the reader learns, by contrasting the two types, to prefer the good. (ref. 6)

Any teacher with a literary training can multiply the examples given above. The point, though, is clear: before the concept of fact came into being, what was written was valued only if it pleased, edified, or persuaded a reader or hearer. But after that concept came into being, literary people clung to the old doctrine because it was person-oriented. Joseph Conrad was enunciating just this doctrine when he said that the goal of writing "is, by the power of the written word, to make you hear, to make you feel--it is, before all, to make you see. That--and no more, and it is everything." (ref. 7)

Some teachers who are facing their first technical writing classes may feel too beleaguered even to recall such apparently remote truths as these. Others may feel that there is nothing profound in the idea that writing, to be good, must move its audience or in the literary commonplace that good writing enables the reader to enjoy increased understanding and heightened perception. What is commonplace to the literary teacher is profound to many technically-oriented students, who, because they have spent several years acquiring masses of specialized information, must re-learn (or learn for the first time) these supposed commonplaces. Nothing is more familiar to veteran teachers of technical writing than student reports full of raw data and, because addressed to no one in particular, useful to no one in particular. New teachers of technical writing, like the veterans, develop in their students the ability to write for readers only be recalling the perspective they gained from the study of literature and imparting it to those students. Conventionally trained teachers of English become teachers of technical writing by learning how to impart to a new group of students what their study of literature has taught them, never by ignoring, forgetting, abandoning, or repressing it.

The technical writer who understands the importance of addressing an audience will grasp quickly the importance of selecting material judiciously and shaping it to the information needs of the audience. Designing reports, like designing anything else, is an imaginative act. Any teacher who has studied the great authors can at once call to mind the ideas about imagination and the poetic process that reading those authors has supplied him with.

Because space is limited, one author, Wordsworth, must stand for many. Wordsworth wrote in 1815 that "imagination . . . has no reference to images that are merely a faithful copy, existing in the mind, of absent external objects; but is a word of higher in ort, denoting operations of the mind upon those objects . . . ." To be a poet, Wordsworth says, one must have the powers of sensibility, invention, observation, and description. One must further possess the power of reflection, "which makes the Poet acquainted with the values of actions, images, thoughts, and feelings; and assists the sensibility in perceiving their connection with one another." To these powers must be added imagination and fancy "to modify, to create, and to associate," and judgment "so that the less shall not be sacrificed to the greater." (ref. 8)

Wordsworth is affirming that in composition the vital factor is imaginative synthesis, not mere accumulation of facts. Imagination, Wordsworth says, shapes facts into meaning "by conferring additional properties upon an object, or abstracting from it some of th se which it actually possesses, . . . by consolidating numbers into unity, and dissolving and separating unity into number." (ref. 8) Referring in a technical writing class to Wordsworth or to theories of the imagination is unnecessary and, because it would appear to students distracting and pedantic, unwise as well. However, the teacher new to technical writing soon discovers that major technical writing texts urge technical students to acquire what is, in effect, a Wordsworthian approach to writing. Or to cite a different author, Sir Philip Sidney, they recognize that "the skill of each artificer standeth in that idea or fore-conceit of the work, and not in the work itself. And that the poet hath that idea is manifest . . . ." In this context it is significant that not surface features, "rhyming and versing," but rather imaginative projection, "feigning notable images of virtues, vices, or what else, with that delightful teaching," is "the right describing note to know a poet by." (ref. 9) Adapting the Sidneian definition to the technical writing classroom is not difficult. While technical writers rarely feign images of virtue and vice, Sidney's "what else" could include the technical writer's created illusion, vital to all technical communication, that the raw facts of a given experiment, investigation, or case happen somehow of themselves to form a pattern. Behind this illusion, of course, is the technical writer, by imagination shaping and sythesizing the inchoate stuff of experience into reports designed to inform and enlighten an identified audience, and thus by imagination engaging in a fundamentally poetic process. Science and technology are far more poetic than some of their practitioners and, ironically, most humanists seem to realize.

Against this extended application of literature to technical writing it might seem easy to enlist Aristotle, the well-spring of much poetic and rhetorical theory, to defend the narrower view of science. In the Posterior Analytics Aristotle comments, "We suppose ourselves to possess unqualified scientific knowledge of a thing . . . when we think that we know the cause on which the fact depends, as the cause of that fact and no other, and, further, that the fact could not be other than it is" (71[b]). But Aristotle did not formulate this description for a modern audience or a modern frame of reference. Nor, as careful reading of the entire Posterior Analytics makes clear, did he mean it to be cited, as it occasionally is (ref. 10), in isolation. More to the point is a statement like Albert Einstein's that in science there is a strong dichotomy between sense data and theory: "The sense-experiences are the given subject-matter. But the theory that shall interpret them is man-made." (ref. 11) Einstein intends "man-made" in its full sense. Citing Hume against Kant, Einstein asserts that "all concepts, even those closest to experience, are from the point of view of logic, freely chosen posits." Thinking, for Einstein, is what one might call a poetic function, "essentially constructive and speculative." (ref. 12)

In the sphere of scientific discovery itself, Einstein contends, even great scientists such as Ernst Mach were slow to recognize the validity of atomic theory because they were victimized by a positivistic philosophic prejudice, which "consists in the belief that facts can and should yield scientific knowledge without free conceptual construction." What really occurs, however, is that concepts, "through success and long usage," cease to be recognized as concepts and begin to masquerade as part of the data. (ref. 12) The reader may by now recognize that the concept that brings pattern ot raw data is also the imaginative synthesis that turns sense experience into poetry. Physics is poetry of matter.

All of this has led, quite properly, some distance from the technical writing classroom. Quite properly, I say, because one must step back from the day-to-day classroom procedure, which to any teacher can threaten to become overwhelming, in order to recognize the common conceptual matrix in which poetry, science, and technology are located. One must step back and review (literally "see again") that Wordsworth's poetic "gleam, The light that never was on sea or land" (ref. 13) makes poetry out of observation just as Einstein's freely posited physical concepts have created modern physics where otherwise only discrete sense impressions would have been.

Other scientists and technologists have seen the imaginative and poetic implications of their work. The great naturalist Louis Agassiz told his students repeatedly that "facts are stupid things" unless they are coupled to some general law. (ref. 14) John Smeaton, virtually the founder of modern civil engineering, discovered the ideal design for a lighthouse by imaginative analogy. Watching a great oak tree withstand a storm, he decided to shape the Eddystone Lighthouse like the storm-resistant bole of the oak tree. Robert McAdam created the road name for him only when he first created a potent simile. A road, he reasoned, is not like a bridge that supports traffic. Rather, it is like a roof that keeps the earth dry so that the earth can support traffic. (ref. 15)

It is, then, an illusion that teaching technical writing requires faculties that a literary person does not possess. Of course teachers of technical writing must neet their students half-way, respecting their students' needs and subject matter. Further, they will wish to learn more about the settings in which technical writing is done, become acquainted with those who ask for and read technical reports, and keep up with the professional literature on technical communication. Most of all, though, they must remember that as humanists they have in their possession a vital insight, that all communication is an imaginative projection of concepts onto otherwise meaningless data to produce orderly, informative papers and reports. Because literary training emphasizes the primacy of imagination in methodizing nature to produce art, it is the best possible preparation for teaching students of science and technology how to imagine audiences, recognize and develop concepts, and select data so that the reports they write will form coherent systems--so that their reports will make sense. These students must free themselves from the dead weight of accumulated fact by learning an essentially poetic process. If we believe in what we ourselves have learned, and if we put aside the insularity that we sometimes acquired while learning it, we are ideally prepared to teach them this process.

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# RHETORIC AND THE BUSINESS ADMINISTRATOR:

# WRITING IN THE PROFESSIONS

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Developing a new course is both trying and exciting, particularly so if the orientation of the course is outside one's field. What could my field -- rhetoric -- contribute to a new course for business administrators? What follows here is an account of how rhetoric, which I take literally as well as theoretically to be the adjusting of ideas to people and people to ideas, can and should shape a course in written and spoken communication outside traditional courses in English. I hope to account for the frustrating gaps that can occur between the planning and the realization of a course as well as to delineate some presuppositions about fitting the world of the student to the world of the course. This tailoring process parallels what Dorothy Augustine says a writer does when "he . . . fixes a frame for his intention about the meaning of X so that it may adjust to the addressee's 'response'," (ref. 1) a response based upon what he, the addresser, knows about his subject and his intended audience. This in turn describes what rhetoric has to do with course or curriculum development as well as with the act of communicating.

I believe the principles I describe here are equally applicable in devising and teaching other courses in writing. We teach -- that is, we get students to practice and to explore -- the underlying principles, the "deep structure," if you will, of a still loosely defined action called composing.

## RHETORIC AND THE BUSINESS ADMINISTRATOR

What training in written and spoken communication is commonly available to the student who intends to move into management after a formal academic program? English 101 and 102 strive to develop basic writing and research skills to enable students to perform college level academic work. Business Communications, Writing for the World of Work, Technical Writing, and similarly titled courses introduce students with special interests to communication requirements in business, industry, and technology. But because some of these courses place emphasis on special forms such as letters and reports, they often do little to introduce students to practical, career-oriented writing situations. And none of these courses is significantly concerned with the rhetorical processes internal to an organization in which a student may seek or hold a job, processes which frequently determine how such an organization functions on a day-to-day basis.

In order to understand the rhetorical processes of an organization, I have looked to the field of management, a field which has application to all organized activity. Management can be defined as an activity which performs certain functions in order to acquire, allocate, and utilize both physical resources and human effort to meet and accomplish a goal. The typic management functions are planning, organizing, controlling, and administering. While all management functions require extensive communication, the functions of planning, organizing, and controlling place heavy reliance upon abstract forms of communication. Accounting ledgers, budgets, computer programs, engineering designs or mathematical models are examples.

Management administrative functions rely more upon written and spoken communication; systems and procedures, job descriptions, purchasing specifications and public relations are examples. Since such communication is highly structured, the emphasis in instruction should be on style, tone, awareness of audience, and purpose -- not on form. Management administration offers an excellent vehicle for the development of an advanced course in rhetoric combined with a survey of the administering functions of management with which our graduates are apt to be concerned.

## COURSE DEVELOPMENT: WRITING IN THE PROFESSIONS

In developing a course called "Writing in the Professions," (ref. 2) a course intended to cut across several professions and serve a diverse clientele, my first task was to select and study those functions of management that deal with the communication needs of an organization. The second was to find practical ways to relate those functions to rhetorical principles. Short of "hands-on" practical experience in business administration, I investigated the problem by reading textbooks in the field, talking with management personnel in a number of areas, and gathering samples of writing actually produced in organizations such as medical centers, heavy machinery companies, computer software producers, and so on. I found abundant study material, so my principal concern soon became the selection, development, and arrangement of that material in preparation for teaching Writing in the Professions.

Specifically, the areas I investigated were in public relations, marketing, purchasing, finance, and personnel administration on the grounds that a person in a middle-management role within an organization is, to greater or lesser extent, involved in each of these areas of concern. As my course took shape in the planning stages, specific "problems" that became the framework for introducing rhetorical principles evolved: a public relations problem, a marketing problem, a purchasing problem, a finance problem.

To illustrate: A <u>management activity</u> is <u>personnel</u>. A <u>subordinate activity</u>, one that can be <u>handled effectively</u> in <u>the classroom</u>, is <u>establishing</u>

staffing policy and procedure. Students in Writing in the Professions could study the communication principles involved (purpose, voice, message, audience) and write a job description and personnel procedure that would be representative of, say, a large medical center or a complex organization such as General Motors. Actual job descriptions and statements of personnel policy (hiring, firing, fringe benefits, vacations, etc.) could be brought into the classroom both by the instructor and by students who have access to them for our primary source of information -- our textbook, so to speak. For the management activity purchasing, subordinate activity buying, we could write bid specifications for a product to be purchased in selected companies, usually those in which students were actually employed. For the management function public relations, subordinate activity consumer affairs, we could write a report and press release explaining a defective product or service. To make these writing activities as realistic as possible, we would try to work with materials pertinent to local or state organizations based in our region.

Basic to the course would be certain key concepts about the role of individuals in organizations, about principles of upward-downward-lateral communication, about interpersonal relationships and how to cultivate and promote them, and about the nature of writing in organizations.

Actually, these concepts fit nicely with comparable ones from rhetoric (and maybe they are the same, after all). For example, we recognize that a rhetorical act involves a discourser (writer or speaker), an audience (reader or listener), a context or "scene" in which communication takes place, a purpose, and a code, as well as the meaning of the message itself. In a business organization, the writers must think of themselves in management roles: fc men, personnel directors, purchasing managers, head surgical nurses. This is a difficult concept both to teach and to learn. The writer writes according to a role, not as "I". Similarly, the writer must think of readers as roles, so the audience becomes a supervisor, a manager of another department, head of the division, a secretary, the stockroom supervisor, president of the company, or a government agency hearing an argument for legislation. Of course people occupy those roles; but the orientation toward viewing both writer and audience in terms of roles is a crucial one.

The context of the communicative act may depend heavily upon the exigencies of a situation or whether a company suffers from "crisis management" approaches on a daily, weekly, or quarterly basis. It may depend upon the degree of hostility between persons or departments over rank, salary differences, and perquisites. Or the context may have much to do with time and available resources to meet the demands of a government contract, with securing cooperation from sub-contractors, or upon the company's ability to perform.

Purpose becomes, for the writer in a management function, largely a matter of securing action. The purpose of writing is to effect some action, to persuade another to adopt a point of view or plan of action, to secure "uptake" in the sense of the reader's recognizing the writer's intention and then reacting to it, to effect purposeful change -- or all of these.

The code or language, whether spoken or written, depends both upon the speaker/writer's ability to interact with others in order to do the job and upon the choice of language most appropriate to getting the job done. Familiar problems surface here. Knowing the audience and having the skill to address audiences (the plural is significant) are two obvious ones. But the speaker or writer must develop an awareness of and sensitivity to what language can do as well. For example, "legaleze" can confuse, mislead, obscure at the surface level. "Computereze" can confuse, mislead, upset, alienate a reader who does not share the jargon, is not as technically oriented as the writer, is not at the same level of administration as the writer, feels less well-educated or knowledgeable, and so on. Finally, physical "presence" and body language must be understood as important factors in analyzing and perfecting spoken communication.

So. The course called Writing in the Professions began to take shape. I would simply find those tasks of communication my research said middle-management people would need to perform; then I would demonstrate how rhetorical schemes and principles of good writing or speaking match those tasks. Simple? Not so.

First, a splendid course might be, and probably has been, constructed along the lines I had planned; but, I soon discovered, my plan would work only for a largely homogeneous student group. Prospective business administrators, technical writers, science writers, journalists, lawyers -- each makes up ideal student groups for whom designing and teaching a writing course would be a relatively easy task. However, these homogeneous groups -- students with similar career objectives, similar professional training, similar interests so far as occupations go, similar academic backgrounds -- did not show up in my Writing in the Professions classes.

Who did? Two ladies who believed I would teach them to become instant stars and get their clever articles published in Readers Digest; a sweet young thing who needed to know how to write reports for a church group; a talented middle-aged woman who had once run a small town newspaper nearly single-handedly but who had had no training in journalism; a man who lobbies for Native Americans; a court reporter who wants to study law; a woman who works as legal aide helping poor people with divorce actions; a young man who distributes a chemical spray device for self-defense; assorted undergraduates (only one a business major); a head nurse on a surgical ward; and a middle-management General Motors employee, Korean born, whose not-too-long-range plans are to become General Manager of that corporation. There were others -- all working toward BA degrees, some employed, some not, with wildly varying backgrounds, ages ranging from 25 to 55. Each wanted something a little different from the course. Each needed something different from the course. Each came into the class with a respectable level of writing and speaking skills -- no remedial problems there. But, as in any other writing class, each student needed to improve communication skills in areas different from other students. In short, what I got was a student population that either had not read the course description or that thought any writing course would cure all communication ills and prepare them especially for individual careers.

Now the problem was to adjust the course to the students in such a way as to give them the basic writing practice they needed and to address some of the aspects of writing in a profession. What needed to be done? Some of my original plans were salvaged, but many had to be drastically changed.

The first significant problem to overcome was teaching students to determine who the writer is and what the writer's role is in an organization. Most students had not thought of themselves as "roles." Thus the problem was depersonalizing most of what they wrote, getting away from expressive writing and focusing instead on audience uptake, on purpose, and on effective formatting of spoken and written messages. One way of getting at this problem was to work with egocentric organization charts which specify the audiences for one writer and one specific document. Students began to see themselves in terms of roles, not names. Egocentric organization charts not only force an analysis of roles and characteristics and tasks (job descriptions, actually), but also bring out the diversity of audiences and their lack of homogeneity. An exchange of job descriptions done orally in class, a "getting to know you" approach suggested by one of the students, turned out to be the best activity we could have done early in the course because our class is a workshop in which writers read, criticize, and react to each others' work. Knowing the other students' occupations and interests and backgrounds helped to establish high morale, reassure individuals that their skills were already high, and create the open atmosphere so vital to a writing workshop.

The second major task was to determine what members of the class do write or present orally on present jobs, what reactions they get to their writing, who writes to them and what reactions are elicited, and to decide as much as possible what specific problems in communication exist in their immediate work situations. Writing job descriptions as a vehicle for getting at this analysis was an eye-opener for many, for it helped them discover the differences between jobs as officially described or advertised and the real jobs they performed. (Not a few decided they were overworked and under-appreciated!) It also reinforced the concept of the writer writing in a role within a complex organization.

A related task is that of determining what kinds of written and spoken communication each student needed to produce for a future profession. Many Writing in the Professions students were in the process of change, retooling for a new career or preparing for a different direction in a present one. We got at this problem by, again, examining and writing job descriptions, and by interviewing people in a student's future field.

Because of the diversity in backgrounds these students brought to the class, we had to learn and practice some key principles of writing that apply generally, for any kind of writing, as well as specifically for writing in a business organization: a law firm, the automobile industry, social services agencies, government, private business, education, and the like. Further, because the group was heterogenous, and because forms such as letters, contracts, proposals, and memos are different from organization to organization, we had to concentrate on effective writing rather than on forms. However, we did take a good, hard look at document design for ideas about effective organization; the impact of visual aids, the psychological effect of white space, typeface, page placement, and so on, on the reader; and readability at the sentence level.

Essential to effective writing in business organizations as elsewhere is an understanding of audience, the role audience plays in determining or shaping the language a writer chooses, the voice s/he projects, the attitudes conveyed by voice and language, and the design of the written document or the oral presentation. We used these ways to implement the study of audiences, related to voice and language: the journal, business letters and memos aimed at target audiences, report writing, and analysis of promotional materials.

Journal writing is, not surprisingly, extremely difficult for many students who have been away from regular undergraduate work for some time. But the journal provides them a place for experimenting with editorials, pleadings, manifestoes, musings, analytical reports of articles from professional journals, and so on. In business letter and memo writing, we specified and varied the audiences: limited audiences, knowledgeable of the subject; anonymous audiences for documents to be kept in the files for 10 years or more; limited audiences, ignorant of the subject; and upward-downward-lateral audiences. One exercise that promotes a real-life feeling for the collaborative writing that goes on in business is group-writing a savings bond drive promotional document or an argument for installing supermarket banking in neighborhood stores. Report writing provides discipline by insisting strictly on directness, succinctness, and thinking through a problem. Here we use Larson's problem-solving heuristic and Young, Becker, and Pike's tagmemic grid as means of thinking through a writing problem or task. A specific assignment for analyzing promotional materials is to study and report on a corporation's annual financial statement to its stockholders. A brief oral discussion as a warm-up exercise helps students to prepare for a later formal oral presentation and gives them an opportunity to explore the possibilities in the subject. "I picked out this brochure on reading stock market reports (Merrill Lynch) because its blue color caught my eye. I don't know why. I'm not especially interested in the subject, but I learned a lot from reading it," confessed one student. Asking why the blue caught her eye and what effect it had on her led to a discussion of the psychological impact of color, what blue symbolizes, how blue makes one feel, and so on. Her terms were "Blue makes me feel secure and warm," which in turn led to her realization of the purpose of the document's originators.

In all these endeavors we emphasized writing to the educated intelligent reader, a concept that unifies the various disciplines and a concept that gives writers not yet writing for a homogeneous, specified audience an audience for which to write -- and an audience that includes themselves and others in the class.

This leads me to the workshop format of the course. This format allows for several important things: my introductory talks (not lectures); demonstrations of a principle such as paragraph organization, features of sentence style, or parts of a business report; and peer criticism. The class makeup includes people with different perspectives on writing and on work. However, they are all motivated (motivation is not a problem -- they've all perceived the relationship between the ability to communicate effectively and job success first hand; all recognize the value of learning to read, speak, and write well; all know they have shortcomings and desire to "fix them"); all are willing, even eager to provide feedback to each other (many have studied the dynamics of group processes, worked with community groups, or organized and led political campaigns). A companion course called Business Communications works less well as a workshop precisely because the group is homogeneous, less experienced, less open to direct criticism from peers whose opinions about the quality of writing are less highly regarded than those of the teacher.

Related to peer criticism is the notion of developing the ability to "code switch." Just as speakers find it necessary to switch from informal to formal codes or from non-standard to standard codes, so do writers find it necessary to gear up their writing to suit a variety of contexts for writing and audiences. Jargon, shop talk, and the various "-ezes" may or may not have a place in a given communication. Students need to know when they do, why they do, and where they do -- or do not. Peer criticism in a workshop setting gives students opportunities to learn how and when to switch codes.

The workshop approach also emphasizes the sound principle that writing is a process. We consider the written product that which grows out of work-in-progress, and it is work-in-progress that we concentrate upon in our class workshop sessions. Successive drafts that capitalize on pre-writing, writing, and revision activities serve the student writer better than textbook exercises which give an explanation or introduce a form and then direct students to "write a letter to your supervisor asking for a pay raise" or "send bid specifications to sub-contractors for plastic 5" toggle bolts to be delivered by sun-up." Rather, we devise a problem (the need for plastic toggle bolts or the need for more salary because there is another mouth to feed), plan an appropriate avenue of approach for solving the problem (and that avenue may not include writing), apply a variety of inventional strategies for generating solutions, write and rewrite, talk and re-talk, draft and re-draft the decided-upon product. The collaborative nature of a workshop helps writers see strategies more rapidly, I believe, than they would in isolated situations.

Sometimes this process leads to documents written by several writers, simulating the joint or committee writing tasks commonly found in complex business organizations. Sometimes the process leads to separate efforts; but the dynamics of the workshop approach help to alleviate the problems of writer's block, of having nothing to say about the subject, or of going off on tangents and missing the point. Incidentally, members of the class have been able to supply real problems for us to work on, problems that grow out of their own work or interests or problems that are shared by the class as members of a community. In the case of assignments that I devise for them, they are free to alter them to suit their own work, and they do so freely. Evaluating for that grade-that-has-to-be-there remains a problem; in order to cope, I try to consider each piece of written or spoken "product" in light of the writer, the writer's needs, and evidence of the writer's effort to improve (given minimal guidelines) as well as the effectiveness of the essay, report, job description, or whatever. I also use an evaluation chart similar to those used in some writing courses in the College of Engineering's Department of Humanities, University of Michigan-Ann Arbor, which fellow students fill out. (ref. 3) But best of all, whenever possible, outside evaluators are asked to judge the effectiveness of a report or proposal. Outside evaluation works exceptionally well for the first assignment, a job application cover letter and resume; for the analysis of a corporation's annual financial statement to stockholders; for oral presentations; and for the final project, an in-depth investigative/persuasive report on a subject of considerable significance to the writer. If the content of such a report is highly technical or outside a body of knowledge I can deal with adequately, I believe it essential that someone else judge the accuracy of the technology involved or the probabilities of the writer's recommendation or proposal. Outside evaluation lends credibility both to me and to the course.

A major concern is that of style and readability. We follow the principles of sentence and paragraph rhetoric illustrated by Francis Christensen and W. Ross Winterowd. (ref. 4) We look at the ways in which paragraphs cohere semantically. We consider the topic sentence, paragraph development methods, making a point and raising issues as ways of developing paragraphs. Some sentence combining has proved effective. Much revision has proven even more effective: moving from nominal to verbal style, from passive to active voice to produce jargon-free prose; defining terms and organizing ideas. We work with sentences that split agent and action, with sentences that fold back upon themselves, with sentences that ramble without focusing on topics or developing ideas about topics.

## SUMMARY

To summarize, I would say that the essential things to present to an all-purpose course for potential business administrators are these:

First, business writing and speaking are essentially referential, persuasive first, informative second. Although discussion and explanation build arguments, the act of informing alone presents problems in a complex organization, for misunderstanding may ensue.

Second, writing for the business administrator is transactional in nature -- a contract, if you will, between writer and reader. But this contract need not be dull and lifeless or faceless. It can be enlivened with wit and intelligence and style, what I prefer to call pzazz.

Third, forms inhibit the creative, exploratory nature of the composing process. Better to leave standard forms to on-the-job training.

Fourth, students must move from the product-oriented paradigm of composing to a process-oriented paradigm. In a product-oriented model, we discuss modes of discourse (narrative, descriptive, expository, persuasive).

We go from word to sentence to paragraph development as they apply to arrangement and style. We are concerned with correctness, with editing accuracy; with organization of parts as they relate to wholes: thesis, support, refutation, conclusion. But in the process-oriented paradigm we are concerned with moving from process to product; with the aims of discourse; with modes of discourse as means to the aims; with the synthesis of invention, arrangement, and style to achieve effectiveness in communication.

Fifth, students need to adjust to the role of business administrator -- no matter how limited -- by running through the simulations of role-playing or by capitalizing upon their actual roles in present employment. While not all students who take a course like Writing in the Professions will go into business or a profession such as law or dentistry, each is inescapably part of a larger social, political, and economic complex. Understanding how to become effective communicators within those complex organizations is rationale enough for "Writing in the Professions."

REFERENCES

1 Dorothy Augustine, "Geometries and Words: Linguistics and Philosophy: A Model of the Composing Process," College English, 43 (1981), 230.

2 Research to develop and implement this course was made possible by a grant from the Research and Faculty Development Fund, University of Michigan-Flint.

3 I am indebted to Professors Dwight Stevenson, J. C. Mathes, and their staff on the Teaching Technical and Professional Communication summer workshop, 1980, University of Michigan-Ann Arbor, for many of the ideas and some specific assignments I have adapted for my own course.

4 A good source for ideas about style and form is Contemporary Rhetoric: A Conceptual Background with Readings, ed. W. Ross Winterowd (New York: Harcourt Brace Jovanovich, Inc., 1975).

Panel I-11

Business and Technical Writing in the Technological World: Implications for the Teacher and Consultant

ASSUMING RESPONSIBILITY:

AN AFFECTIVE OBJECTIVE IN TEACHING TECHNICAL WRITING

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The need for effective technical writing has become more urgent than ever before. Health, safety, and economic well-being depend on effective technical writing by professionals in industry as well as government. An effective test report in an automotive company can result in serious accidents among the public at large; it can result in costly recalls that jeopardize the economic health of the company as well. Effective technical writing requires writers to master a series of cognitive skills, and these form the objectives for our technical writing courses in industry as well as in college. Management strongly supports these objectives, and relies on teachers of technical writing to achieve them with their students and employees.

I have learned from management, however, the need for an additional objective in technical writing courses, an affective objective: the willingness to assume responsibility for one's report. Ineffective technical writing also can result from a writer's inability or unwillingness to assume responsibility in a report.

A professional writing a technical report often must assume the responsibility for the consequences of the report. This is a two-step process. First, the professional must formulate the conclusions and recommendations implicit in his or her technical analysis. Second, the professional must ensure that these are acted upon as necessary. Although to do so requires cognitive skills, assuming responsibility for a report primarily requires the writer to be willing to do so. This is an affective objective that should be introduced into technical writing courses in college and in industry.

I first developed an awareness and appreciation of this need when working with the Manager of Truck Testing and Development at an automotive proving grounds. Even if we had enabled all of his engineers to express themselves clearly and concisely in the appropriate rhetorical structures and formats and with the necessary technical material, it would not, it turned out, have been sufficient. We also needed to enable them to assume responsibility for their reports.

To this manager, assuming responsibility meant that his engineers must have the willingness and ability to formulate conclusions and recommendations.

That is, he wanted his engineers to report that:

"The durability characteristics of the GN83 brake package are satisfactory" (a conclusion)

rather than that:

"The GN83 brake package passed the DP488 durability test" (a result)

He furthermore wanted his engineers to report:

"Release the GN83 brake package for the 14200 lb GVW QR 600 models" (a recommendation)

The abilities to formulate conclusions and recommendations are cognitive skills--and ones difficult to master--that we must teach professionals on the job. To teach these cognitive skills, however, we also must develop in professionals the willingness to assume responsibility: that is an affective objective. Many professionals are reluctant to expose themselves, and many assume that to do so is to be unobjective. Professionals, however, should be taught to make judgments when the communication situation calls for judgment. A test engineer who restricts herself to the statement, "the GN83 brake package passed the DP448 durability test," forces a supervisor or manager to interpret this result and formulate the organizationally relevant conclusion. Yet, the test engineer usually is in the best position to make those judgments. A result such as, "the brake package passed the durability test," does not necessarily imply that the package is "satisfactory" and should be "released." There have been situations where that has not been so, and recalls have been required.

The professional, in addition, must ensure that appropriate action is taken as well as be willing to make judgments. This is the second aspect of assuming responsibility, and is a matter of an appreciation of a need, again an affective objective.

The accident at Three Mile Island dramatically illustrates this need. Simply put, Three Mile Island was a technical communication failure. On September 24, 1977, an incident occured at the Davis-Besse nuclear plant that was strikingly similar to the incident at Three Mile Island. The operators mistakenly turned off the high pressure injection system and momentarily uncovered the core. Fortunately, however, Davis-Besse was operating at only 10% of power. On November 1, 1977, February 9, 1978, and February 16, 1978, three memos were sent within Babcock and Wilcox (the contractor who supplied the nuclear steam supply system for both Davis-Besse and Three Mile Island) that asserted that unless instructions were changed, the core of a nuclear plant could become uncovered and a meltdown become possible. This in fact is exactly what happened at Three Mile Island. During the hearings of the President's Commission on the Accident at Three Mile Island, Mr. Bert Dunn, Manager of the Emergency Core Cooling Systems Section at Babcock and Wilcox, who wrote the February 9 and 16, 1978, memos, said:

"Had my instructions been followed at TMI II, we would not have had core damage; we would have had a minor incident."

Mr. Dunn recommended certain actions, but did not appreciate the need for follow-through to ensure that action was taken.

On August 3, 1978, Mr. Donald Hallman, Manager of the Plant Performance

Services Section of Babcock and Wilcox, wrote a memo, to Mr. Bruce Karrasch, Manager of the Plant Integration Section at Babcock and Wilcox, to inform him of Mr. Dunn's recommendations and that, because the Nuclear Service Section had raised some questions, the recommendations had not been acted upon--although Mr. Dunn's memos "suggest the possibility of uncovering the core if present HPI [high pressure injection] policy is continued." Mr. Karrasch in fact had been on the distribution list for Mr. Dunn's memos, but testified about each that "my memory does not recall my reading the memorandum or taking action on it." Mr. Karrasch, however, did remember receiving Mr. Hallman's memo, but did "not recall reading it very carefully at the time" and "thinking that they were rather routine questions." He "placed a note on top of the memorandum to one of two people who report to me in Plant Integration, with a message to him to please follow up on this and take any action that you seem [sic] appropriate." Those persons were Eric Swanson and Arthur McBride. Again:

MR. KANE: Do Mr. Swanson or Mr. McBride recall ever receiving this memorandum of August 3, 1978, from you?

MR. KARRASCH: No, sir, they do not.

The August 3, 1978, memo from Mr. Hallman to Mr. Karrasch, in which Mr. Hallman stated that action had not yet been taken on Mr. Dunn's recommendation, also has Mr. Dunn on the distribution list. Mr. Dunn, however, testified he didn't receive it:

COMMISSIONER LEWIS: Mr. Dunn, I'd just like to get something clear. When did you first become aware of the Hallman memorandum? Was that after Three Mile Island or earlier, the August memorandum?

MR. DUNN: That was after Three Mile Island.

On March 28, 1979, the operators at Three Mile Island failed to activate the High Pressure Injection system in time; the core became uncovered and a partial meltdown occured. On April 4 and April 17, 1979, Babcock and Wilcox issued new instructions to the operators of its nuclear reactors. These instructions were those recommended by Mr. Bert Dunn in his memos of February 9, 1978, and February 16, 1978. As Mr. Dunn himself testified, "Had my instructions been followed at TMI II, we would not have had core damage; we would have had a minor incident."

Three Mile Island, then, was--perhaps primarily--a communication failure. As the testimony suggests, this certainly was inadvertent. An examination of the testimony and of the memoranda suggests that the communication failure to a significant extent resulted because these professionals were unaware of the need to ensure that appropriate action is taken. Throughout this year-and-a-half period they assumed that action was being taken, but none bothered to see that it was. Essentially, these professionals did not appreciate the need for them to assume that responsibility. The testimony makes clear that, had they appreciated that need, they not only would have been willing to do so, they would have done so.

These examples therefore illustrate how teachers of technical writing must establish affective objectives as well as skills objectives. They must teach their students to be aware of and to be willing to assume the responsibility for their reports. Achieving this affective objective, in practice and especially on the job, is a precondition for achieving the skills objectives we traditionally have emphasized in our technical writing courses.

## References

The automotive proving grounds reports are proprietary, so I have changed the test situation components and documentation information. Except for those changes in specific information, the quotations are literal.

The Three Mile Island references are, in order of presentation, Transcript of Proceedings, President's Commission on the Accident at Three Mile Island, Public Hearings: July 18, 1979, p. 144; July 18, 1979, Exhibit No. 5 (the other memos referred to are Exhibit No. 1, No. 3, No. 4, No. 9, and No. 10); July 19, 1979, p. 239; July 19, 1979, pp. 240-241; July 19, 1979, p. 241; July 18, 1979, p. 117; July 18, 1979, Exhibits No. 9 and No. 10.

# BUSINESS AND TECHNICAL WRITING IN THE TECHNICAL WORLD: IMPLICATIONS FOR THE TEACHER AND CONSULTANT

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The key word dealt with by our panel this morning was implications, for the teacher and the consultant; and we can surely agree that our speakers were exceptionally faithful to their task: Professor Ferrill in reviewing problems of communication between technical and non-technical personnel and specifying solutions; Professor Driskill in apprising us of an extra burden on the shoulders of the technical writer, that of staying clear of liability suits; Professor Squires in her sensible, forthright statement on being a successful consultant; and Ms Knight in speaking of her experiences in Houston as an industrial technical writer. All of these reports should be required reading in our technical writing courses.

The implications that concern the consultant, the teacher, and the product of our instruction, the technical writer, have been clearly stated, and I do not believe that they need to be reiterated by me at this time. I would like to take a moment, however, to comment further on one of these reports, that of Professor Driskill (with apologies to the other panelists), and I do so because that report touches matters that concern us professionally beyond our immediate topic of technical writing.

Times have changed. Not too long ago an English teacher or professor had, legally speaking, one of the safest jobs in the world. This person had not one small care about the possibility of a lawsuit that might arise from some professional act on his part, and had no reason to, unless he or she respectively engaged in frequent, flagrant, and sordid sexual activities with students.

Then the Congress of the United States enacted a law guaranteeing a "right to privacy," and suddenly the teacher was before the bar of justice for the heinous crime of posting grades and for maliciously passing graded material "up the row" from student to student to recipient. At my university the faculty members were solemnly counseled that when they returned graded materials to students, they should place each offending document in a hermetically sealed envelope and present it personally -- hand to hand -- to the student. To be really on the safe side, we were told, we should print instructions on the envelope advising the student to break the seal only in a very private place, such as the bathroom.

Far more chilling, professional duties that we once performed with relative immunity (though not with pleasure), such as serving on promotion, tenure, and grade appeals committees, have become legal minefields.

My university's Grade Appeal Counc l has retained a legal counselor who is not only a practicing lawyer but who has been approved to argue a case before the Supreme Court of the United States, a precaution that is really not too extreme when we recall that not very long ago one of our colleagues in Georgia was incarcerated for declining on the witness stand to divulge his secret ballot vote cast in a closed tenure committee meeting. Reluctantly and a bit sadly last month I took out a hefty professional liability insurance policy "just in case," an act that I would have scoffed at ten years ago. Colleagues were lined up behind me as I did so.

And now Professor Driskill informs us that the legal specters hovering over the teachers are now haunting their students. Those whom we enticed to be English majors, those whom we lovingly nurtured in advanced composition and technical writing courses, those whom we -- and I particularly must cry "guilty" to this charge -- have strongly encouraged to seek careers outside of the classroom, especially careers in technical writing, must now be warned that sometime, somewhere, perhaps when they least expect it, they may find themselves facing a candid jury.

But, alas, may not these jeopardized graduates complain, in turn, "Who trained me inadequately? Who sold me that line that technical writing is a promising career for English majors? Who?" I do not know about you, but I am glad that I have my insurance policy. Get yours before the premiums go out of sight. And by the time we meet again next year in San Francisco, do not be surprised if every pen and pencil sold in this country carries the following label, placed there by order of the Attorney General of the United States, "WARNING: Using this instrument may be hazardous to your health."

TRENDS IN LIABILITY

AFFECTING TECHNICAL WRITERS

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## WHY LIABILITY RATES A WARNING

When most people think of "product liability" they imagine consumer products like "PAM" and hair dye, industrial and agricultural chemicals such as xylene, propane, and malathion, and equipment such as tractors and truck-lifts. In a product liability case the definition of "product" includes more than these easily imagined physical products. Product liability decisions have pronounced defective a wide variety of product components: brochures, catalogue data, price lists, advertising (both mail and periodical ads), care and use books, warranty cards and explanations, instruction manuals, installation manuals, repair manuals, shipping and display tags, labels, nameplates, decals, field assembly and/or installation services, service and maintenance, and spare or replacement parts. Obviously, technical writers are involved in creating many of these product components.

Even this broader picture of what constitutes a "product" does not show all the ways in which writers are involved in the prevention and defense of product liability actions. In a key decision in the case of Barker v. Lull Engineering (1978), the California Supreme Court made two rulings, one of which has special significance for writers:

> "Second, a product may alternatively be found defective in design if the plaintiff demonstrates that a product's design proximately caused his injury and the defendant fails to establish in light of the relevant factors, that on balance, the benefits of the challenged design outweigh the risk of danger inherent in such design." [emphasis added]

The court was explicit: the burden of proof is on the defendant company to persuade the trier of fact that the merits of the design outweigh the risk. As a result, all the documents generated during the products' life cycle--design memos, design tests, clinical trials, trial use reports, letters, proposals, etc.--take on an urgent relevance, because these documents are likely to become the only available means of showing that the product was not defectively designed. These documents will become the evidence that the product underwent balanced and well-considered planning, development, testing, quality control, and field testing. Thus, technical writers who prepare any of the attending pre-sale or post-sale documents and any technical specialists involved in product design, development and testing can be drawn into the arena of product liability litigation.

The arena is getting bigger, fast. Product liability suits in the United States, which were being filed at the rate of about 50,000 per year in the 1960's, increased during the 1970's to 500,000 a year, and may average nearly a million per year in the early 1980's, according to alarmed estimators. The Federal Government's Interagency Task Force on Product Liability concluded after an 18-month study that these estimates were much too high and that only 60,000 to 70,000 actions went forward annually.

The precise number of cases is probably less significant than the soaring costs of liability insurance. In 1978, manufacturers and retailers paid an estimated $ 2.75 billion for product liability insurance, compared with $ 1.13 billion in 1975. For some companies, insurance rates rose more than 200% in a single year. The panic price jumps by the insurance companies, added to the costs of legal fees and claims have created a crisis among manufacturers. Further, state supreme court judges changed several standards by which cases are judged in a series of precedent-setting cases that have encouraged the filing (and winning) of liability suits, which has in turn driven up costs.

Although the majority of cases are still brought on the basis of a defect in production, more and more cases are filed on the basis of "failure to warn." Plaintiffs' attorneys see several advantages in basing cases on the failure to warn or to give adequate instructions. The plaintiff often can prove his case without the expense of expert testimony and without preserving the physical evidence that is required in proving defects of manufacture or design. Further, the jury is more easily able to grasp the need for better warnings or directions than to understand the claimed deficiency of a complex design or manufacturing process. The defendant company can less frequently claim that the plaintiff had expert knowledge and was therefore guilty of contributory negligence. Thus, with more cases turning on "failure to warn," technical writers will be increasingly involved in the prevention and defense of product liability claims.

As if the expanding number of cases were not threat enough, the duty to warn has been expanded. For example, formerly it was held that a manufacturer or seller was not negligent if he failed to warn of danger that arose in the use of a product in an unlikely, unexpected, or unforeseeable manner [United States, <u>Littlehale v. E. I. du Pont de Nemours and Co.</u> (DC NY) 268 F Supp 791, affd (CA NY) 380 F .2d 274; also, Louisiana, <u>Merwin v. D. H. Holmes Co.</u> (1969, La App) 223 So .2d 878; and others]. Recent decisions have gone the other way. For example, Faberge was held responsible and paid $ 27,000 when a teenager poured perfume over a burning candle in order to scent it. Faberge claimed that it could not have foreseen that the product would have been poured on an open flame, a clear misuse of the product, but the defense was not accepted [<u>Moran v. Faberge, Inc.</u> 332 A .2d 11. 273 Md 538].

Implications of precedents and new laws should be noted by technical writers and watched for further developments, especially by those who contract to write pre-sale and post-sale documents. The inclination to extend liability suits to include third parties may or may not eventually allow plaintiffs to bring suit against technical writing contractors and consultants. The State of Indiana has provided that a manufacturer can bring anyone who is actually at fault into a lawsuit as a third-party defendant. At present, it appears that employers in Indiana are the ones most likely to be named as third-party defendants, generally for actions leading to workplace accidents, such as unauthorized modification of equipment or failure to transmit warnings delivered by manufacturers. The possibility of being named as a third-party defendant becomes more ominous because of precedents providing that any ambiguity in the language of a warning furnished in connection with the sale of a product is to be "construed against the one who chose the words used." Schilling v. Roux Distributing Co. (1953) 240 Minn 71, 59 NW .2d 907. WARNING: It is time for technical writers to know more about liability.

LEGAL BACKGROUND

The current situation, which law professor A. S. Weinstein has described as caveat venditor--let the manufacturer beware--developed in a series of events over the last twenty years. For a hundred years before that, the situation had been caveat emptor--let the buyer beware--although gradually court decisions began to give buyers some protection. In 1842 a British mail guard riding shotgun was thrown from a coach and injured. When he sued the contractor who had supplied the coach to the Royal Postmaster, claiming the vehicle was defective, his claim was denied on the grounds that he had no privity of contract with the manufacturer. The privity requirement prevented most injured persons from suing manufacturers. The landmark case, MacPherson v. Buick Motor Co. in 1916 and subsequent cases altered the privity requirements and allowed injured persons to sue the manufacturers in some circumstances.

Most important, in 1962 the California Supreme Court set forth a doctrine of strict liability. The court explained that manufacturers are in a better position to prevent the sale of dangerous products than others, and if injuries occur from the use of products, manufacturers are best able to equitably distribute the losses among consumers. Subsequently, strict tort liability doctrine was elaborated in Section 402A of the Second Restatement of Torts, a publication of the American Law Institute. This private organization, made up of lawyers, judges, and professors, had no law-making powers, of course, but most state legislatures have since adopted some form of strict liability as a basis for product liability actions.

Even if a product is designed perfectly and manufactured free of defect, the product can be considered defective and the manufacturer negligent if he fails to warn the users of dangers that may arise in the use of the product. A Colorado court affirmed (1979) that "a product which is free of manufacturing or design defects nevertheless may be defective and unreasonably dangerous if not accompanied by adequate instructions and warnings" Anderson v. Heron Engineering Co., Inc. 604 P .2d 674; similarly in Embry v. General Motors 565 P .2d 1294, 115 Ariz 433 (1977).

## LIABILITY PREVENTION PROGRAMS

The implications of "duty to warn" as it arises in product liability suits should be understood by all technical writers and technical professionals who write as part of their ordinary duties within organizations. Writers are in a key position to reduce costs and delays in the production of pre-sales and post-sales documents and to improve the efficacy of all warnings to consumers.

One way that technical writers can assist their companies is heading or participating in pre-accident products liability prevention and control programs, also called products integrity control programs. These programs, aimed at improving the safe design and production of the product as well as the adequacy of pre-sales and post-sales documents, accompanying tags, stamped warnings, and decals, should benefit consumers by creating better products and instructions. They should also benefit manufacturers by reducing the number of accidents and the number of claims by documenting the company's efforts to produce safe, reliable products and to provide proper guidance for users.

Several programs have been proposed, but they have many similarities. The key steps in such programs are summarized in the following excerpt from a report of the Subcommittee on Capital Investment and Business Opportunities of the Committee on Small Business of the House of Representatives, House Rep. 95-997, March 21, 1978, pages 68-69:

1. An explicit company policy concerning product safety, quality control, and risk prevention.

2. Rigorous testing of the program within the context of its use environment.

3. A product loss control committee headed by a person representing top management, who has clear authority to coordinate loss control activities. Members of the committee should include representatives from research, engineering and design, production, quality control, marketing, legal, safety, and insurance departments.

4. Procedures to assure that government standards and regulations which apply to product safety are understood and considered at all operating levels and are used as minimum requirements in product design.

5. Procedures for evaluating the potential for personal injury or property damage during use, or reasonably expected misuse, or products or changes in existing products.

6. Review of existing quality control procedures in relation to developing product liability law. Procedures that are clearly defined, well understood and closely followed.

7. Adherence to quality control and inspection procedures that are systematically documented.

8. Conspicuous posting of warnings and instructions in a permanent form where such information is necessary.

9. Review of all advertising, brochures, labels, warnings, warranties, and instructions by engineering and legal departments to insure that the information provided is accurate, clear and complete.

10. Permanent coding of components in order to identify the source, place and date of manufacture.

11. Systematic procedures for investigating product liability incidents and implementing remedial measures where necessary.

12. Maintenance of records through the expected life of each product, to include information on research, design, tests, quality control, sales, service and ownerships.

Although each one of these "steps" expands into many organizational processes and actions, the summary conveys an overall picture of the concerns of such a program. Articles describing these programs are listed in the bibliography.

Because product integrity or liability prevention requires the collaboration of a wide variety of company specialists, a program can be coordinated by the head of publications as well as by other engineering or production specialists. Most important, the technical writer should realize that he or she is involved in product integrity and product liability prevention whether a formal program exists or not. To reduce the costs of product liability prevention and control, technical writers must understand who must warn, who must be warned, when, and about what, and they must know what criteria will be applied in the evaluation of their warnings and instructions. This article reviews pertinent trends and points out cases to familiarize technical writers with the general but significant aspects of product liability.

WHO MUST WARN

The basic rules that govern the duty of manufacturers or sellers to warn of product-related dangers are set out in the American Law Institute's Second Restatement of Torts, mentioned earlier. The basic rule is that an individual or company supplying a product (chattel) to someone else must warn the buyer:

(a) if the supplier knows or has reason to know that the product is likely to be dangerous for the use for which it is supplied, or
(b) if those for whom the product is supplied are not likely to know that the product might be dangerous, or
(c) if certain conditions might make use of the product dangerous, even if the product is not dangerous in itself.

The supplier is subject to liability for harm caused by the product to those whom the supplier should expect to use it. This responsibility to warn holds whether the supplier provides the user with the product directly or supplies the product through a third person. The responsibility of the supplier extends to those who are not direct users but who are endangered by the product's probable use (such as bystanders, persons in the vicinity, etc.).

The duty to warn does not arise from the status of being a manufacturer or seller, or from the nature of the product, but from the superior knowledge that the manufacturer is supposed to have. A manufacturer is charged with having superior knowledge of the nature and qualities of its products, and is obligated to keep abreast of scientific information, discoveries, and advances pertaining to its business. For example, in Griffin v. Planters Chemical Corporation the manufacturer of a pesticide was determined to be negligent for having marketed a product that had toxic qualities unknown to the manufacturer. The company had not tested the product for toxicity and gave no warning. The label used, although in compliance with the requirements of the Secretary of Agriculture, was held inadequate. A retailer's employee was examining products at a distributor's place of business when a bag of one percent parathion dust burst open and the employee was exposed to its contents Griffin v. Planters Chemical Corp. (1969, DC SC) 302 F Supp 937. Manufacturers formerly were not usually held negligent for failing to warn when the manufacturer had no actual knowledge of the hazardous character of the product (for example, see Briggs v. National Industries (1949) 92 Cal App .2d 542, 207 P .2d 110), but they seem more likely to be held responsible for full knowledge of any dangerous potential now. For example, in a well-known case, Little v. PPG Industries, the appeals court held that "a manufacturer's failure to provide adequate warnings does not depend on manufacturer's knowledge of danger; such knowledge is assumed, and it is failure to give adequate warning that renders product unreasonably dangerous" 579 P .2d 940, Wash. App. 812, modified 594 P .2d 911, 92 Wash. .2d 118 (emphasis added).

Sellers as well as manufacturers many times are bound by the duty to warn. Where the non-manufacturing seller knows or should know that the product is or is likely to be dangerous for the use for which it was supplied, the seller has the duty to warn the buyer. In contrast, if the seller is merely a conduit in the distributive process, for example, selling a packaged product without the package's having been opened, the seller has no duty to warn of a dangerous characteristic of which he knows nothing Crandall v. Stop & Shop, Inc. (1937) 288 Il App 543, 6 NE .2d 685. Non-manufacturing sellers in some circumstances do have a duty to warn; for example, if the seller sells a large quantity of a particular product or acts as a distributor, he has superior knowledge, as in McLaughlin v. Mine Safety Appliances Co. (1962) 11 NY .2d 62, 226 NYS .2d 407, 181 NE .2d 430. And if the seller knows of the dangerous qualities of a product and also knows that the label or name of the product does not adequately convey knowledge of the danger to the buyer or to the public, he has a duty to warn Bower v. Corbell (1965, Okla) 408 P .2d 307; and Jones v. Hittle Service, Inc. (1976, Kan) 549 P .2d 1383, 219 Kan 627. And if the seller repackages, modifies, or alters the original product, he has a duty to warn.

In a 1979 case, the court affirmed the finding of the trial court, and dismissed the appeal, concluding that the doctrine of superseding or intervening cause was particularly appropriate "when the intermediate buyer is a large industrial concern with its own safety programs and method of product distribution and where the manufacturer may have no effective means of communicating its warnings to the ultimate users" Reed v. Pennwalt Corp. (1979

Wash App) 591 P .2d 478, 222 Wash App 718, affirmed and appeal dismissed, 604 P .2d 164, 93 Wash .2d 5. However, when the intermediate customer is not in a better position to pass on the information, giving notice to the seller is not enough. In Shell Oil Company v. Gutierrez, 581 P .2d 271 (Ariz App, 1978), it was determined that Shell had a duty to warn a welder of the danger of explosion from an empty drum of liquid xylene which had been used by an intermediary seller, Christie Oil Company, who repackaged the product in 55-gallon drums and affixed only a flammable liquids symbol on the top of the drum. The court affirmed the jury verdict for the plaintiff:

> ". . . whether a warning beyond the manufacturer's immediate vendee is required in a particular case depends upon various factors. . . . Among them are the likelihood or unlikelihood that harm will occur if the vendee does not pass on the warning to the ultimate user. . . and the ease or burden of the giving of warning by the manufacturer to the ultimate user. . . . Shell failed to adequately warn Christie or Flint of the danger of explosion, the possible precautions, or the type of labeling that would be appropriate."

Professionals, such as physicians who recommend the use of a product, select the product on the basis of superior knowledge, and are responsible for warning clients of product hazards. But if a manufacturer suspects that no professional will intervene who is capable of warning the user, then the manufacturer must supply warning labels and instructions, as in products supplied for large scale injection or immunization programs.

WHO MUST BE WARNED

Certainly, no duty to warn exists where the product is not dangerous or likely to become dangerous in an foreseeable use or circumstance. No duty to warn exists where the danger is obvious. The court dismissed the complaint when Valerie Brown sued Tennessee Donut Corporation after sipping hot coffee from a styrofoam cup and burning her lip and spilling coffee on her leg. The danger that freshly served coffee may be too hot to drink is an obvious danger. Obviousness is usually a matter of the age and experience common to persons similar to the injured person. However, where there is a difference of opinion over the obviousness of the danger, the degree of obviousness presents a question of fact.

One class of users need not be warned, regular users of the product and those whose professional education, training, and experience have given them expert knowledge of the danger. For example, in Hamilton v. Hardy (1976, Colo App) 549 P .2d 1099, 37 Colo App 375, the court said that plaintiff could not complain that he did not receive from the manufacturer and retailer instructions and warning regarding matter which, by reason of his own prior experience, he understood and appreciated. However, manufacturers must estimate carefully the level of knowledge users will have. But in Griggs v. Firestone Tire and Rubber Company 513 F .2d 851 (8th Cir. 1975) a workman who was securing a wheel to a truck suffered permanent injuries when a tire and rim assembly exploded. The defendant argued they "assumed that most people servicing its rims would realize the dangers and possess the requisite aptitude and experience to assemble the rims safely." In this case, the rim components of the wheel had been mismatched at an earlier time. The need to match parts properly was described in Firestone catalogues, but many local service stations did not have these catalogues. The court disagreed with the company, and recommended that a warning be stamped directly on the product. The expertise of users and the availability of warnings to experienced users should always be considered.

In general, those who must be warned are those who rely on the superior knowledge and advice of the manufacturer or seller and persons who cannot inspect or test the safety of a product (see William Cronen v. J. B. E. Olson Corp. (1972 Cal) 104 Cal Rptr 433 App & E 989). Those in danger, even if a small fraction of the public, must be warned.

One trend that seems to be developing is the substitution of a stricter standard of care in regard to those warned. In Tampa Drug Co. v. Wait (1958 Fla) the court pointed out that "implicit in the duty to warn is the duty to warn with a degree of intensity that would cause a reasonable man to exercise for his own safety the caution commensurate with the potential danger," and added that it is the failure to exercise this degree of caution after proper warning that constitutes contributory negligence, 103 So .2d 603, 75 ALF .2d 765. More recently, the "prudent man" standard has been substituted for the "reasonable man." Prudent persons, being more concerned about making protective judgments, require a more detailed warning and warning about less likely or less severe hazards in order to give themselves greater protection. For example, in Hubbard-Hall Chemical Co. v. Silverman the court ruled that "adequate warning . . . is one calculated to bring home to a reasonably prudent user of a product the nature and extent of the danger involved" 340 F .2d 402 (1st Cir. 1965). In this case the defendant's label, which was approved by the Department of Agriculture, was not satisfactory and the court admonished that "there is no authority that by obtaining governmental approval the defendant had met the possibly higher standard of due care imposed by the common law of torts . . . ." The substitution of the "prudent man test" for the "reasonable man test" has occurred in other areas of professional services, such as accounting, law, and medicine, and appears to be a trend in product liability as well.

Finally, one other trend is changing the population of persons who must be warned. Recent decisions have extended the duty to warn to include illiterate persons, children, and persons who do not speak English. The claim that the user is illiterate is no longer a defense for the adequacy of a warning. In Hubbard-Hall Chemical Company v. Silverman, the court also emphasized that "the defendant should have foreseen that its admittedly dangerous product would have been used by, among others, persons like plaintiff's intestate, who were farm laborers, of limited education and reading ability, and a warning, even if it were in the precise label submitted to the Department of Agriculture would not, because of its lack of a skull and bones or other comparable symbols or heiroglyphics, be adequate instructions or warnings of its [parathion's] dangerous condition." In earlier cases, such as S. C. Johnson & Son, Inc. v. Palmieri (1958, CA Mass) 260 F .2d 88 the courts held that the trier of facts was entitled to assume that the plaintiff could read. Other cases have demonstrated that graphics if not multi-language warnings must be used to convey severe hazards to children, their parents and persons who do not speak English.

## WHAT DANGERS MUST BE EXPLAINED

Three questions are specially important in determining whether a hazard exists about which the supplier must give a warning:

1. How likely is it that an accident will occur when the product is used in more or less the expected manner?

2. How serious an injury is likely to result?

3. How feasible is it to give an effective warning?

The decision to warn involves these questions plus the standard of due care that is applicable in the situation. In general, Kenneth Ross advises companies that suppliers should warn against: "a. An inherent danger in the product which is impossible or difficult to avoid (e.g. drugs); b. A danger that can be avoided if certain precautions are taken before or during use of the product (e.g. poison, flammable material); c. A danger that can be avoided if instructions as to proper methods of use are followed" ("Pre-Accident Prevention of Liability: Manufacturer's Products Liability Prevention Programs," in Prevention and Defense of Manufacturers' Products Liability (1978)). In addition, warnings must also be given when a foreseeable circumstance or unintended use could cause danger.

The extent and severity of the hazard must be explained, so that the user will have adequate notice of the possible consequences of use or even of misuse. The standard has been vividly expressed in Post v. American Cleaning Equipment Corp.: "As an example, it may be doubted that a sign warning, 'Keep Off the Grass,' could be deemed sufficient to apprise a reasonable person that the grass was infested with deadly snakes. In some circumstances a reasonable man might well risk the penalty of not keeping off the grass although he would hardly be so daring if he knew the real consequences of his failing to observe the warning sign. Or, a warning to 'Keep in a Cool Place' might not be sufficient if the result of non-observance was a lethal explosion of the container" (1968, Ky) 437 SW .2d 516. Potentially hazardous deviations from expected use must be declared so that serious consequences may be avoided. Thus, suppliers must now expect to warn against:

a. dangers associated with expected uses of the product, especially all hidden or non-obvious dangers
b. all accidents that might develop through unforeseeable use (because of some property of the product, e.g. flammability)
c. all accidents that might develop through foreseeable misuse (e.g. warning against using lawnmower to trim hedge), and
d. modification or hazards resulting from improper maintenance or repair.

The overall effect of these changes is to require a more thorough and comprehensive effort to warn of all suppliers.

## WHAT MAKES A WARNING ADEQUATE

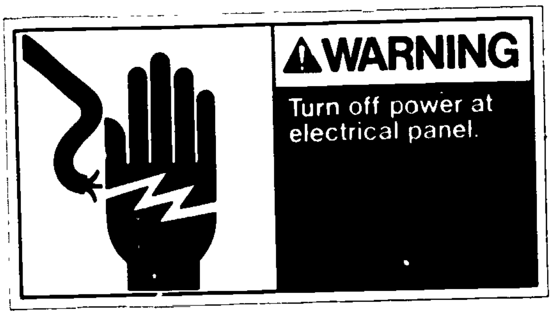
Specifying what makes a warning adequate is more than moderately difficult, because many case decisions affirm that adequacy is a matter for the jury to decide. For example, in Burch v. Amsterdam Corp. (1976 DC App) the appeals court declared that "sufficiency of a particular warning by a manufacturer or seller of a product as to risks involved in the use of such product is ordinarily a question for the jury" 366 A .2d 1079. Not only is adequacy a matter for the jury to decide, the court need not furnish guidelines to the jury, although some do so: "In strict products liability case, trial court may rule as a matter of law that warnings are inadequate when, and only when, danger is clearly latent and in all other cases, adequacy of both content and prominence of warnings accompanying a product is a question for the jury, and court need not furnish guidelines to aid jury in its determination" Berry v. Coleman Systems Co. 596 P .2d 1365, 23 Wash App 622. The latitude of the jury thus becomes one of the many variables that the technical writer must keep in mind when trying to prepare an adequate warning. What a Virginia jury will consider adequate may not suit the criteria deemed appropriate by an Oregon jury. Thus, no absolute standards can be recommended.

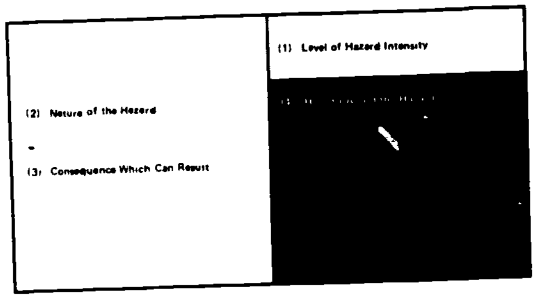
Several federal agencies control the language and format of certain labels, for example: Consumer product Safety Commission, 16 C.F.R. 1500.121 et seq. and 42 Fed. Reg. 23,052 (1977); Environmental Protection Agency, 40 C.F.R. 162.10; Occupational Safety and Health Administration, 29 C.F.R. 1910.145; Nuclear Regulatory Commission, 10 C.F.R. 20.203. The fact that the requirements are established by regulation, however, does not ensure that compliance will be deemed adequate to fulfill the supplier's duty to warn, as was noted earlier in Hubbard-Hall Chemical Company v. Silverman and in Griffin v. Planters Chemical Corp. Because each regulation is limited to a single industry, product, or situation, overlapping standards can cause problems for writers. In general, technical writers should check with the company counsel or with an expert in liability law to determine which regulations are likely to apply to the company's products. After that, the technical writer should apply his own knowledge of liability in devising warnings that meet the most extreme case and the least able user's needs and have the warnings reviewed by the products integrity committee.

The basic test that a technical writer might apply would demand that a warning tell the seriousness of the risk involved, explain the kind of risk in a way that the reader will understand it, tell how to avoid the risk, and command the attention of the user at the point of use. Other writers have recommended that warnings be accurate, fair, strong and clear, plain, readily noticeable, timely, and actually communicated. Inasmuch as a jury may be able to emphasize or ignore any one of these, this series of standards must only be taken as a tentative guide. The decisions in some cases indicate how such standards may be interpreted.

Sufficient to command the user's attention at the point of action. Recent cases have caused the courts to elaborate on the ability of the warning to make an impression on the mind of the user at the point of action. In Shell Oil Co. v. Gutierrez (1978 Ariz App) the court commented that whether the warning given was adequate "depends on language used and the impression that it is calculated to make upon the mind of the average user of the product" and noted that "adequacy of the warning label on the product is not determined solely by reference to words on the label but also by reference to physical aspects of the warning, such as conspicuousness, prominence and relative size of print; all of such physical aspects must be adequate to alert the reasonably prudent person" 581 P .2d 271. And in Little v. PPG Industries, Inc. (1979 Wash) the finding was that "the applicable question is whether the warning was sufficient to catch the attention of persons who could be expected to use the product and was sufficient to apprise them of its dangers and to advise them of the measures to take to avoid such dangers" 594 P .2d 911. A concerted effort may be required from writers, designers, graphics specialists, and psychologists trained in human factors engineering in order to determine the proper placement of the warning. Sales representatives and buyers' purchasing agents might also contribute information about th.. likely use and workplace conditions in which the product might be used.

Appropriate and commensurate to potential danger. Bowen H. Tucker's analysis of product hazard communications provides a useful example of a method for integrating graphic and verbal elements of warnings. He recommends the integration of written communication and pictorial or symbolic representations to alert the broadest range of possible users. His system of presenting warnings calls for showing in the warning (1) the level of hazard intensity, (2) the nature of the hazard, (3) the consequences that can result if the instructions to avoid the hazard are not followed, and (4) instructions on how to avoid the hazard. He advocates a standard system of warnings and representations, something like the international driving symbols, that could be used to warn national and even international purchasers. His system warns of three levels of hazard intensity: danger (immediate hazards which WILL result in severe personal injury or death); warning (hazards or unsafe practices which COULD result in severe personal injury or death; and caution (hazards or unsafe practices which could result in minor personal injury or product or property damage). An example of his formats and warnings follows:




Cooperation with other specialists in the product integrity program team and testing of warnings and manuals before adoption. Making the writing of warnings and other product components part of a systematic effort to ensure product integrity has many advantages for technical writers. Better information about hazards will be available to the writer; better advice about new developments in liability litigation can be obtained from the firm's legal counsel; assistance from the graphics division can improve the ability of warnings to command the attention of users; and more adequate records of the company's efforts to balance the hazards of designs against their merits will be available in the event of liability actions. One further objective can also be accomplished. At present, the adequacy of any warranty, instruction manual, or label can be undermined if the jury decides that the user was lulled into false expectations about the safe use of the product by misleading advertising. For example, if the advertising for a product claims that it is "equipped with fail-safe brakes" and the brakes subsequently fail, a well-written warranty may be breached and the plaintiff may collect. The unified action of the entire group of persons involved with product integrity can lead to the elimination of inconsistencies in product literature as well as to the prevention of accidents.

## FUTURE RESPONSIBILITIES

Technical writers, as the group of persons who "choose the words," should expect to lead efforts to improve the quality of the many product components that are delivered to the consumer in written form. To provide this leadership they must become familiar with the pertinent regulations, with the standards of voluntary associations, and with trends in liability litigation. New laws, patterned after models such as those created by the American Law Institute or the federal uniform product liability law announced by the Department of Commerce and introduced by Representative Preyer of North Carolina as H.R. 7921 but not passed during the last session of Congress, may affect the criteria that warnings and other written product components must meet. No single source or magic touchstone is known. Technical writers will have to face a responsibility similar to that confronting every jury determining what language and notice will be sufficient to command the attention of the actual users of a product under the full range of possible circumstances in which the product may be used and to give them clear notice of the necessary action to keep themselves safe from harm.

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# HOW DO TECHNICAL AND NON-TECHNICAL PERSONNEL COMMUNICATE?

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In an industrialized nation which depends on highly technical information, communication occurs across various strata among experts and among experts and lay persons. Many persons with both technical and non-technical backgrounds spend much of their time writing in technical fields. One of my first experiences as a writer (with a non-technical background) occurred in the marketing department of Texas Instruments. I often had to discuss a project with an engineer in order to write about it. I often found communications between us difficult. This experience has led me to ask several questions. How do technical writers view the writing process? Do persons with technical backgrounds view the writing process differently from those with non-technical backgrounds? How do technical and non-technical personnel communicate with each other? Could I discover an interview model which would facilitate communications between technical and non-technical personnel?

To investigate the writing process I interviewed 15 persons who spend much of their time writing in technical fields. Of the 15 interviewed six have degrees in technical fields such as organic chemistry, medicine, and engineering. The other nine had non-technical degrees in such areas as education, journalism, English, and other liberal arts degrees. I asked those surveyed questions about the writing process, with special emphasis on the pre-writing phase. I wanted to find out what they perceived as their main concerns and their main problems. I also listened to three interviews between writers with non-technical backgrounds and engineers. From these sessions I drew conclusions about the types of information which a writer is often trying to obtain from consultations with technical experts, which allowed me to draw a model of questioning procedures.

The writing performed by persons interviewed falls into two categories. In one category the purpose is instructional or informational, including technical procedures for installation or use of equipment, diagnostic procedures, and product descriptions. In the other category the purpose is motivational, implying that some action is to be taken by the audience. This category includes financial and sales reports, administrative reports, and brochures. As the table below illustrates, the writers with technical degrees write instructional-informational material while those with non-technical degrees are divided between both categories. Personnel interviewed write in either one category or another;

Table 1 — Writing Categories of Personnel Interviewed

| Type of degree | Informational | Motivational |
|---|---|---|
| Technical | 6 | 0 |
| Non-technical | 4 | 5 |

there is no cross-over Of the 15 whom I interviewed, it seems that those with non-technical degrees may be able to find writing jobs in more diverse fields. Those with technical degrees seem to be placed more often in jobs which require writing in the areas of procedures or product descriptions.

My first question was whether technical writers use written resources or interviews with experts most often in gathering and understanding material to be written about. Written resources include manuals, drawings, encyclopedias, and articles. Experts are defined as those who have technical degrees in the areas in which they work. The table below illustrates that both technical and non-technical personnel involved in writing rely on written material more than interviews with experts.

Table 2 Resources Used Most Often in Pre-Writing by Personnel Interviewed

| Type of degree | Interviews with Experts | Written Material | Both Used Equally |
|---|---|---|---|
| Technical | 0 | 4 | 2 |
| Non-technical | 2 | 4 | 3 |

None of the writers with technical backgrounds could say that they use interviews with other experts most often in their writing, although two said that they use experts and written materials equally. One scientist revealed that it was often difficult to get scientists to consult with each other because of the fear that their ideas would be used by someone else. A highly specialized medical doctor involved in heart implant research said that although he did consult with others in his field, it was difficult to communicate with persons whose expertise differed very much from his own. One engineer confided that he had difficulty in following the "buzz words" of engineers in a different field. Even those with technical backgrounds have difficulty communicating with other experts, even if they are in related fields.

Of the non-technical people, the two who depend most on interviews with experts write in highly specialized fields. One writes computer program manuals; the other writes instruction manuals fo the use and installation of oil field equipment. These persons are dependent on the experts for explaining the procedures and for editing for accuracy. Both write for audiences who do not have the expertise of the persons who designed the programs or equipment. These two technical writers feel that it is an advantage not to have a degree in a technical field. Because they are lay persons, they feel that they can identify with their lay audiences and anticipate answering any questions which the audiences might have.

Both the technical and non-technical personnel mentioned the same difficulties in consulting with experts. Arranging time for an interview seems to be a major problem. One writer said that she often had to resort to showing engineers that meeting with her was to their advantage, since manuals had to be ready before the products which the engineers had designed could be shipped. She also appealed to their empathy by informing them of her deadlines.

Writers had the following difficulties in discussing pro  ts with experts:

understanding experts' vocabulary
understanding methods and procedures explained by experts
establishing mutual respect
writers realizing their lack of knowledge in an area

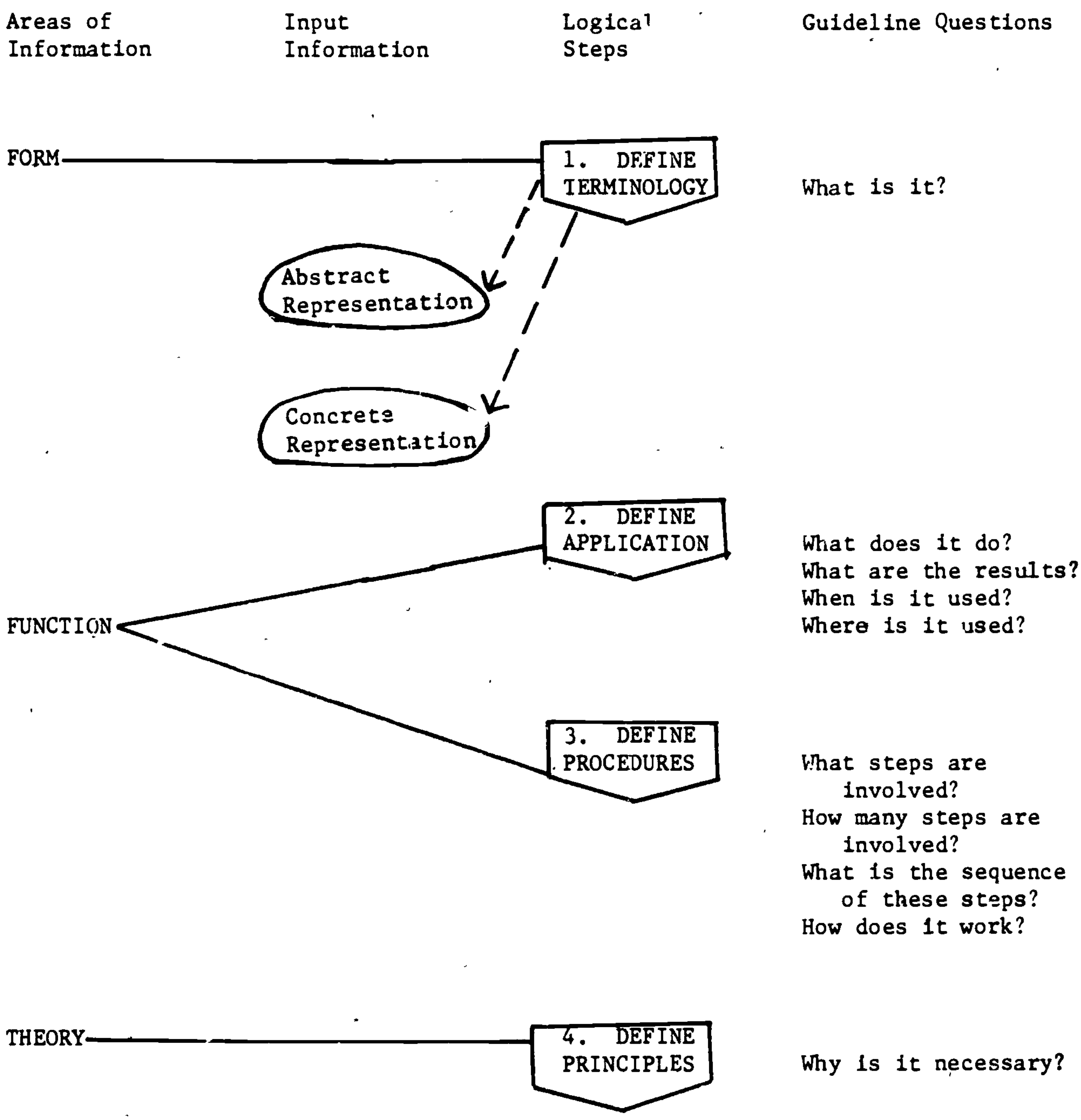
In learning vocabulary, methods, and procedures, writers consult manuals, drawings, specialized reference books or other writers in their departments. If the material they need is undocumented, they have to go to the experts in the field. As I have already mentioned, difficulty with vocabulary is not restricted to non-technical people. One general practicioner in medicine said that he had difficulty understanding the vocabulary of other specialists in medicine.

In building respect from experts writers endeavor to learn as much about a technical area as possible, reading manuals and books. Writers with non-technical backgrounds seem torn between trying to conceal their lack of knowledge and asking questions to gain a clearer understanding. One writer told of a problem which he often encounters in dea  ; with engineers, "They [engineers] think that you understand their explanations immediately." I suspect that part of the reason for engineers believing that non-technical persons understand immediately occurs because lay persons do not reveal that they do not understand, fearing that they will lose respect. Another reason for non-technical writers neglecting to get all the information needed is that they have not identified what they need to know. Often they have a vague feeling of uncertainty about the material, so they arrange consultations with engineers without clearly organizing the questions which they need to ask.

One interview session which I attended between a writer with a non-technical background and an engineer illustrated that the writer thought he needed to ask one question, but in fact he needed the answer to another one also. He began the interview by asking about the sequence involved in installing two pipes. The engineer gave him the specifications on the two pipes: one 5" in diameter; the other 9". One pipe was to be installed inside the other. The writer had not realized that the main problem was his not knowing the dimensions. Once he knew the dimensions, the sequencing was clear.

The writers interviewed who often consult experts find that they have difficulty controlling the interview. The writers would start with a specific question. This question would be answered by the expert, but then he or she would often begin to elaborate upon the equipment while the writer simply took notes. After the interview the writer would try to decipher his or her notes and determine if they contained what was needed. This type of interviewing often leads to the need for further interviews to obtain all the necessary information. If the writer controlled the interview, time could be spent more efficiently.

Figure 1 Elements of Understanding Technical Material



In talking with writers with non-technical backgrounds, I found that most of the questions which they want experts to answer fall into a few categories: terminology, application, procedures, and principles. I have devised a model (Figure 1) which consists of the elements needed for understanding technical material, especially that material which consists of procedures or product descriptions. Along with the types of input (such as terminology) I have written questions which pertain to these specific types. The types of input are arranged in a sequence beginning with terminology and ending with principles. If the writers use this model as a basis for interviews with experts, asking questions about any categories which writers realize that they do not understand, they might have better results. Such a model would help writers to identify areas in which they need clarification. This model provides a systematic approach to information gathering.

In learning terminology, the writer may become familiar with either an abstract representation (drawings, verbal definitions) or a concrete one (actual equipment). The terminology portion may be the one which writers can most readily learn without having to consult someone else. Whether writers have to rely on written material or consultations they must ask the question "What is it?" before they can proceed to further understanding of the material. In discussing terminology with experts they may have to ask for comparisons with known objects or known procedures or they may have to ask experts to make crude drawings so that the objects can be visualized.

In writing about equipment, writers should take any available opportunity to actually view the equipment. One writer told me that he had attended maintenance seminars to view the equipment and learn applications. Another said that he visited the stockroom to look at parts. Viewing the equipment makes the concept of form more realistic in terms of contours and dimensions.

The next step after understanding form is understanding function. This step consists of two parts: application and procedures. Application is learned when the writer pursues the question: "What does this do?" To understand procedures the writer must ask questions relating to "how." He or she must ask for steps involved and sequence.

To completely understand an object or process, the writer should understand the principles involved. One writer told me that if he could understand the laws of physics involved he could more readily understand the process. Most non-technical persons interviewed are not concerned with this level of knowledge. But if writers understand the underlying principles, "the why's" of application and procedures, they would have an overview of their subjects which would allow them to see the logic involved.

If the writer uses this model he or she should be more able to define the areas in which he or she needs further knowledge. Using such a model as an interview schedule should provide more control of the interview and a checklist of the understanding needed.

The last area which I looked at in my survey had to do with the primary concern of writers after they had gathered their information. Table 3 illustrates the concern which writers thought of most often in the pre-writing phase.

| Table 3 | Primary Pre-writing Concerns of Personnel Interviewed | | |
|---|---|---|---|
| Type of degree | Purpose | Audience | Organization |
| Technical | 6 | 0 | 0 |
| Non-technical | 1 | 7 | 1 |

Technical personnel were not only more concerned with purpose than were non-technical personnel, they also mentioned that establishing purpose was often a problem for them. They had difficulty in focusing their content. Technical personnel may have difficulty with purpose because, to a large extent, they do not consider audience; purpose is a natural outgrowth of the needs of the audience. The technical personnel interviewed write only for technical audiences and they write informational material. They assume that the audience has the same expertise that they have. Three non-technical personnel who write informational material are concerned with audience. They are concerned with the informational needs of the audience, with anticipating questions and with simplifying material.

Of the writers whom I interviewed only those with non-technical backgrounds write motivational materials. Writing motivational materials requires a concern with audience. Only one writer of motivational materials is concerned with purpose; all the others are concerned with audience. The one concerned with purpose has few ways of knowing her audiences directly; she is a free-lance writer of promotional materials for various clients. The other writers of motivational materials write with an audience response clearly in mind. They are trying to sell a product or gain consent and build enthusiasm for a project. They are concerned with persuasive tactics, so they are aware of their audiences' needs, prejudices and levels of expertise. Awareness of the audiences' needs provides a guide to purpose and focus. These writers, all non-technical, realizing the needs of their audiences, understand that their rhetorical tasks are either to recommend or request or explain, etc. Concern with audience seems to lead to fewer difficulties with establishing purpose and focusing written material.

I have tried to provide a summary of the primary pre-writing concerns of fifteen technical writers. Although this sample is too small to be conclusive, it does show some trends. I have compared the pre-writing concerns of writers with technical and non-technical backgrounds. I have reached the conclusion that ability to relate to audience is of primary importance and that non-technical personnel are more aware of this consideration than are technical personnel. Those writers who interview experts as part of their jobs find that these experts have difficulty relating to writers' needs and levels of expertise. By using a model of elements involved in understanding technical material, writers can probably control their informational needs more adequately. Using this model to control the interview with technical experts, the writer can make these experts more aware of his or her needs as a writer. Conversely, if the writer focuses on the audiences' needs, he or she has little trouble in establishing purpose in writing.

A PROBLEM OF IDENTITY: WHO ARE YOU
WHEN YOU'RE BEING WELL PAID FOR IT?

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## I. Mental Set of English Teachers

An English teacher who puts on the consultant's hat may be surprised, unpleasantly, at how unnatural it feels. The unnaturalness has numerous causes. A few of those causes and a few possible solutions to this new identity problem are briefly discussed in this paper.

First, the "mental set" of the English teacher is not well suited for consulting work. People who teach composition, whether in secondary education or at the college level, think of themselves as English teachers: the grey-haired "battle-ax" we all dreaded as school children. We rarely think of ourselves as rhetoricians, composition specialists, or as professors of composition and rhetoric. We must describe ourselves in new ways if we are to do new work.

Like other professionals, we value ourselves, at least in part, according to what we are paid. And we are grossly underpaid. When I teach at a local community college, my wage per class hour is $18.00. If I spend five hours for each class hour, for a total of six hours of work, I earn $3.00 per hour--below the minimum wage. If I spend less than five, my students do not learn as much as they should, nor do I teach as well as I could. To earn a living at this rate of pay requires working nights and weekends, without overtime pay, of course. These conditions naturally color our image of ourselves.

Because we have grown accustomed to being underpaid and overworked, we expect nothing else. We even compete fiercely with one another for the opportunity to be overworked and underpaid. I once competed with several hundred other recent Ph.D.'s for a guaranteed "burn-out" job in an unscenic location which would have paid me $11,000 a year. Why did I waste the stamp? The job shortage in our profession has made fools of some of us. We do what no self-respecting garbage collector or pipe-fitter would ever do: we work for almost nothing.

Those of us who finished degrees before the current wave of specialization in composition have an additional smudge on our self-images. Although we have experience teaching writing--and experience is finally what counts--we are not equipped with the latest jargon in our field. We are not armed with readability tables and psycholinguistic theories--at least not last month's versions. We lack the mystique of the incomprehensible specialist.

All of this is compounded by certain invisible economic barriers that hold us back. Our aims are low. We hope some day to make as much money as our colleagues who have been at it for twenty years: maybe $20,000, just before we retire. The upper limit in our economic universe is the salary of our chairperson: perhaps $25,000. In a larger department, perhaps $35,000. Many will try for $30,000, few will ever receive it. So we look upwards a very little.

To a significant extent, our future is limited by our short sight. We confine ourselves. What we cannot imagine, we are not likely to achieve. What might we imagine?

## II. The Basis For A New Self-Image

We might see ourselves in a broader context, a larger, more prosperous world, as an essential factor in U.S. business and industry. We have a skill, honed by years of drudgery, that business and industry needs and does not have. There is more work to be done outside of our academic institutions than inside of them. And we could be paid more for it outside of them, than inside.

In terms of absolute cost, we are presently teaching writing in the least expensive way--in colleges and universities where the public bears a large part of the expense and where we are willing to work long days for small salaries. Outside of this nonprofit sector, this protected environment, our services have a greater absolute cost--and thus a greater value to us. If I spend one hour with a practicing lawyer and charge $50 (a moderate figure), that lawyer will think it is a bargain (because his hourly rate is higher). I will think it is a bonus because my university pays me an average of $10 per hour for my work with law students. The economic picture is not so simple as that, of course, but it's safe to say that our work is worth three times more outside than inside of our academic institutions.

## III. Some Principles of Successful Consulting

How do we harvest that profit? Choose a business or industry compatible with your interest or experience. The more familiar you are with it, the more effective your work will be. The key here is to know the "terrain" before you travel over it. Every business, industry, and profession has its own kinds of written communication, its own language, and to some extent its own style of writing. Offer your services only after you know exactly what you would be working with and what specific help you can offer.

Try to identify communication problems that are commonly complained of within the business or profession. This might be done by simply asking people who work within an organization to tell you what their communication problems are. Acquire copies of typical written work. Map out the lines of written communication: Who assigns writing tasks? Who writes? Who reviews? Who edits? Who proofreads? Who types? Who reads? Who complains about ambiguity or clarity problems? How are such complaints handled? How much time do the writers have? What type of mechanical assistance do they have (word processor, dictating machines)?

When you have mapped the terrain, then decide how to approach it. First attempt to solve the communication problems currently complained of within the organization. Then address the other inefficiencies in written communication that you, with your special expertise, perceive and can solve.

As you research, pay attention to what people inside the business or profession charge for their work or are paid by their companies. Discover what the hourly rates or salaries are of the people you wish to work for. Discover what they pay other consultants. Set your hourly rates according to the "going rate" in that business. Be careful not to undercharge. To some extent, people value services according to their cost. If you charge too little, your work may be undervalued. Of course, if you charge too much, you may have no work. The problem is obvious: once you have set an hourly rate, it is hard to increase it, and it may be too late to decrease it.

If you are charging enough--which from an English teacher's point of view may seem to be a great deal--you will want to offer "full value." This may lead to offering too much. When working outside of your own field, you must simplify. Concepts and approaches must be simplified. Terminology of the grammarian must be carefully defined, perhaps even omitted. Begin at the beginning: Outside of our field, people do not necessarily know the difference between "good" and "well" and probably do not know how to locate the subject and verb in a sentence or how to distinguish between restrictive and nonrestrictive phrases and clauses. Normally, a "lay" audience will not know the difference between a phrase and a clause. So begin at the very beginning. Do not try to impress your audience with technicalities or with the latest findings of psycholinguists and researchers in readability. You may want to toss a term or two in for "window dressing," to establish your "credit" as a specialist, but do not try to teach anything with such language. When you begin your real work, keep it simple and practical.

I do not mean to suggest that creating an "aura" or "mystique" is a waste of time. The contrary is true. You must have what Aristotle termed "ethical appeal" if you are to succeed. Consulting success depends on image as much as on expertise. Above all, you must sound "correct," you must speak grammatically, and you must communicate clearly in writing and orally. You must in your own articulation serve as an example of what you are "selling." But there are two phases to a consultant's work: the first is selling oneself--the "image"; the second is providing a service--the "expertise." In the second phase, always simplify, that is, try to teach a few basic things well.

## IV. How To Establish Credibility

### A. Institutional Service

Before you have the opportunity to teach a few basic things well, you must get the job. Consulting work depends on "credibility." You must establish a reputation outside of your field. How might this be done?

Institutional service is one way to begin. Most colleges and universities offer lectures on a wide range of topics. A list of faculty members willing to lecture as a public service is kept somewhere, perhaps in an office of lectures and concerts. Add your name to the list. Even though you will not be paid directly, you will enhance your academic reputation as well as reaching out into the nonacademic world. If you wish to work in a business or profession, contact the continuing education personnel in the appropriate department or school in your institution. If you contribute to a seminar as a panel member, for example, the notice that will be mailed to alumni and interested parties will provide free advertising for you. If a business school advertises your name in this way, for example, you will have established a measure of "credibility" without much effort, and no cost. Then, of course, you must perform well. That in large part (as discussed above) depends on knowing your audience.

Another way to begin is to investigate continuing education programs within a business or profession. Workshops are regularly offered in nearly every field of work. Good speakers and useful topics are hard to find. Our topic is in vogue at present; it enjoys a cyclical popularity, which is currently at its height. If you do find yourself on a panel for a lecture series or workshop, you may discover that what you have to say is the most useful part of the entire program. Since you will probably be the "odd speaker," that is, the only "lay" person on a panel, you will have built-in "visibility." This can be a tremendous advantage. Here again, while you will probably not be paid for this work, the advertising is invaluable. It is advertising without the stigma of advertising.

That raises the question of whether or not to advertise in newspapers or elsewhere, that is, paid, public advertising. I do not recommend it. It is expensive and may actually reduce your credibility. If your advertisement is positioned next to that of a local astrologer, a hypnotist, or a computer dating service, you may invite the wrong kind of attention. The best advertising is word-of-mouth, personal reference. Use the business card provided by your academic institution (you will probably have to pay for it) and distribute it sparingly. Do not project a "slick" image. Such an image contradicts basic assumptions that most people have about English teachers. While we must improve our self-image in order to work profitably outside of our field, we may still make good use of the public image we have. We need not dress at the height of fashion; that may even interfere with our credibility. We need not spend $300 on an impressive briefcase. We need not fly first-class. We may, if we wish, without suffering any diminution of our image in the outside world, travel economically and dress plainly.

On the other hand, we should adopt the same professional standards as our clients in business matters. For example, we should use the same format for correspondence. If the professionals you wish to work for send memoranda to one another, then send memoranda, not letters. Return telephone calls the instant you return to your office, not several days later. Send follow-up letters, if that is customary. Keep a precise time sheet for all work that you do; bill promptly and specifically, providing exact times, dates, names, and the nature of the work you have done. Remember that as employees in a nonprofit sector of the economy, we are not accustomed to thinking of minutes as economic units. Time is money in a "for-profit" organization. Your minutes as a consultant are correspondingly valuable.

If consulting work goes well, you may find that you have too much to do: your teaching and your "field work" outside the academic world may add up to an 80-hour week. Like any other professional, you should consider doing first the things that pay you best. Everyone else does. This is obviously not a sufficient reason for grossly neglecting students; but, in these inflationary times with academic salaries as low as they are and will remain, we are justified in diverting some of our professional time and energy to work that pays well. After all, if your students do not receive all that you have to offer, in the classroom, perhaps they will, some years down the line, have to hire you as a consultant.

## PROSTITUTION AND THE WRITING CONSULTANT: A VIEW OF A VIEW

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### I. The Indictment

I have usually regarded my writing consultant work as a challenge, sometimes as a burden, sometimes as a reward for assertiveness, but always as an arduous task. I make approximately ten times my academic hourly wage for consultant work, but even that figure falls somewhat short of the rates charged by doctors, lawyers, and other professionals offering specialized services. Considering the level of skill and experience I need to do the job well, the effort it necessitates, and the anxiety it produces, I never consider myself overpaid, undeservingly paid, or improperly paid. I therefore was completely non-plussed during an otherwise pleasant faculty lunch when a friend and colleague (totally unprovoked by the conversation) condemned my consulting activities as "a form of prostitution." Too surprised to reply, I remained silent, and the subject was dropped.

The surprise subsided, but a growing curiosity took its place. What had she meant? Do others feel the same way? Why should an English professor disapprove of teaching for pay in the professional world? I started asking people and was once again surprised, this time at the number of negative emotional responses I received. I have put together here some of their responses and some of my perceptions concerning their reactions, together with some of the arguments in favor of writing consultantships.

### II. The Responses

I asked nearly 40 English professors (from several universities) how they felt about their colleagues taking writing consultant jobs. Few responded with outright enthusiasm, and none found anything praiseworthy about the activity aside from the financial benefits it offers. From the people who responded positively I heard words like "enterprising" and "fortunate" and phrases like "it's about time" and "why shouldn't we get a share." Not until I attended a session on writing consultantships at a national conference did I hear anyone mention a single non-monetary benefit.

The negative responses were as strikingly varied as the non-negative responses had been homogenious. The mildest charge was the one of irresponsibility, that I was wasting precious time that could be better spent on my own research, on extra preparation for lectures, or on yet more detailed responses to my students' work. In its most virulent form, this developed into a charge of disloyalty: Since I had accepted employment at a particular University, any teaching I did extra-murally was suggestive of a breach of loyalty, perhaps even of a breach of contract. My University's regulations make a most interesting distinction in this regard: Faculty here have the right to consult for one day a week without seeking formal permission;

however, faculty are not permitted to teach courses for another university without the Dean's approval (and such approval, I understand, is rarely given). I imagine that this distinction was made with professors at the Law School, Medical School, and Business School in mind, for whom outside consulting work most often takes the form of advising rather than teaching. Many of the people I questioned felt that since a writing consultantship consists mainly of teaching, it indeed conflicted with the contract to teach only for one's primary employer; yet at the same time no one seemed to feel it would be wrong for an English professor to charge for instruction or advice given on any subject other than English composition.

Such were the tendencies of what I would categorize as the logical negative responses. The emotional negative responses grew out of different sorts of objections. The charge of prostitution apparently had something to do with charging strangers for what should be given away free at home. Many believed that English professors pollute academic purity when they have direct contact with the business world (often referred to as "the outside world"); that they negate their academic nobility when they stoop to solicit funds from corporate entities or limited partnerships; and that they violate the academic oath of poverty when they receive pay that is immorally high. (Four to five hours of consulting work a week can double the average English professor's income.) Three times I heard the complaint that "it simply isn't our place" to be doing these kinds of things.

I noticed that some of the poeple who attacked consulting in general seemed to forgive my own involvement in it because of my extreme financial need. (For a few years I must live in Chicago while my wife lives in Philadelphia. We commute by air to be with each other every weekend, creating a financial burden which cannot be supported by the salary of an Assistant Professor of English.) It appears that under extreme circumstances almost anything can appear respectable (cf. Rosie the Riveter in the 1940's).

Of the forty or so people to whom I spoke, about one eighth approved of consulting, three eighths did not disapprove, one eighth expressed what I have called logical objections, and three eighths expressed what I have called emotional objections.

## III. Some Musings on the Responses

I have no credentials in psychology, and therefore what I offer here represents instinctive reaction, mostly in question form, rather than formal analysis. I have been led to spend time thinking about the subject only because so many of the reactions were so severe and so lacking in reasoned argument.

Whether or not I am "wasting my time" by consulting (when I could be in the library or in my study) depends on what is to be understood by the word "my." Have we academics (or at least those in the Humanities) made the assumption that since we do not punch a time-clock for a 40-hour week and most often cannot accomplish our tasks in a 40-hour week, that there should be no limit whatever to our week? Since our work is quite capable of expanding to fit whatever time we give it, must we in turn expand all of our non-leisure time to cover our work? At what point does time in the week become "my" time?

I remember how shocked I and my classmates were in the first year of graduate school to hear an Assistant Professor explain that he regarded his job as a nine-to-five set of responsibilities, and that he religiously abstained from all academic work in the evenings and on weekends unless the circumstances were exceptional. We were not merely surprised; we were outraged. How could he be so undevoted to the Shrine, so unfeeling about the products of the Muses, so defiant of the Powers That Be?

That was in 1969. In 1981, when trolley drivers can demand paid holidays for their birthdays, when unions have invested the word "overtime" with an awesome and threatening power, and when a whole symphony orchestra will stop in the middle of the concluding page of a piece in rehersal because the clock has struck the hour (a sight I have witnessed), there are few of us left who value the work we do enough to say the clock be damned; but must those few of us who do love our work for its own sake go to the opposite extreme and insist that no time can be "overtime," that no time can be "our time"?

I could not fathom the charge of prostitution until I looked at consulting as charging for that which should be freely given. Have the teachers who hold this view of consulting convinced themselves somehow that they are not being paid for teaching, that there is no actual connection between the daily tasks and the monthly checks? Is money for them dirty, undignified, and symbolic of selfishness, while teaching is pure, noble, and symbolic of altruism? They seem to have dedicated themselves to their work so comprehensively and so without expectation of reward that they conceive of a grateful University issuing them a monthly check solely so they can take care of the merchants and landlords of the world who do not understand the concept of a "calling." (I felt exactly this way for the first eight years of my teaching career, albeit my getting paid $2,000 for a year of 40-hour weeks of teaching as a graduate Teaching Fellow might have had something to do with that.)

Another possible link between consulting and prostitution is the concept of being for hire and the assertive activities that accompany it. We do not expect a University professor to be on the street, as it were, selling his or her wares. How strange it seems to some of us for a teacher to travel the streets to the corporate office or the law firm, dangerously beyond the academic walls. Those same teachers would feel quite differently about the same teaching experience, I imagine, if a law firm arranged with the Dean for a special small class in Advanced Writing for Lawyers to be taught in the Humanities Building, a special fee going to the instructor. More of us must face the fact (sometimes apparently discomforting) that we are indeed paid for the teaching we do, and that we should not be ashamed of it. As for being on the streets -- we all will learn our way around town quickly enough.

Even if we are aware of being paid for our teaching, we tend not to conceive of it as piece-work. When a student withdraws from a class, we do not consider the event an increase in our salary rate; and yet fiscal administrators think of us in almost no other terms. A Department will gain or lose faculty spots dependent upon the numbers of students it attracts, and most of of us are at least vaguely aware of these supplies and demands. I am not suggesting that we develop a piece-work consciousness as professors ("There! Another weekly paper graded -- $1.76 more in the pot."). I merely offer our being unused to thinking of our work this way as another cause of our considering consultant work, with its clock-watching and high rates, as foreign and therefore inimicable. With a little conscious effort, we could all accustom ourselves to the different game rules (without coming to confuse one game for the other).

My worst fears are that this problem goes far deeper than this, that at bottom it is more often than not a poor professional self-image that makes some of us unable to welcome work outside the University with enthusiasm. We of Academia (and in particular those of us in the Humanities) have good enough reason to tend towards professional schizophrenia: On the one hand the college professor is rated in a first-place tie with the medical doctor in the "most respected profession" polls; on the other hand we are often thought of (and think of ourselves) as "mere schoolteachers," the old adage "Those who can't do, teach" ringing in our ears. The latter image has the better chance of dominating simply because we are the most egregiously underpaid professionals in America. All other people who have the training and skills of an academic make more money, usually a great deal more money; and even within Academia the English professor ranks with the lowest on the salary charts. (In many universities the highest English salary and the lowest Law salary are within a year or two's raise of each other.) To add to the lack of monetary rewards, we lack visibility to anyone but ourselves and our students. The people who most often judge our daily actions are undergraduates (who have a habit of graduating, going out into the world, and making far more money as electricians, bus drivers, and surgeons) and our colleagues (for whom and with whom we form our own inbred hierarchies). How natural it is, under these conditions, that we should feel out of place ("it simply isn't our place to be doing these kinds of things") in some law firm or corporation office -- so out of place that we refuse to go there, castigating those who do.

Our task as writing teachers often is thankless; some of us have grown to expect no thanks and believe ourselves unworthy of thanks. Our task as writing teachers often seems fruitless (one term being too short a time to see progress in more than a few); some of us have grown to assume the job cannot be done at all and that we are perpetrating a fraud by being continually paid, however low the rate, to do it. I do not think we should look for thanks from our students, though thanks may come on occasion without our looking; but I know the job can be done and has often been done. We must understand that the teaching of writing results in the improving of a skill, a process that will not conform in time to a quarter, semester, or trimester. Many of the seeds we sow in a class of 20 or 25 students will bear fruit at some later time, and even the student may not recognize the source of the harvest. Whether or not we choose to seek thanks or to expect fruit, we must not reject them when they come or mistrust those who offer them. Consulting work can bring immediate thanks, both in sentiments and in money, and bear dramatically nutritious fruit, in terms of the immediacy of our effect. We are the skilled professionals who can offer the service, now needed more than ever by other professionals, and we must start to look upon ourselves as having the stature to do it as well.

## IV. Attractive Reasons for Doing Consulting Work

I mentioned above that most of the people who approved of English professors taking consulting jobs thought only of the financial advantages involved. While I would not by any means wish to undervalue the attraction and importance of high wages, I would like to point out that we can also reap professional (especially pedagogical) benefits from doing consulting work. By teaching outside of the University, we can become better teachers within the University.

Consulting offers us a new variety of students and therefore a fresh, different teaching experience from the one with which we are so burdensomely familiar. The importance of variety in one's professional tasks cannot be overestimated. I took English in High School from a man who purported to be a teacher, whose yellowed notes gave off a slight smell of sulphur as they continued to disintegrate, and who was quoted, only slightly unfairly, as beginning a lecture in 1959 with "As President Coolidge recently said. . . ." We did not learn much. Variety is not only the spice of life but the insurer of sanity, especially for those of us whose tasks are inherently so repetitive.

Consider the advantages of teaching in a consultantship relationship over teaching in the conventional classroom.

- -- The clients will often be self-selected and eager to absorb what you have to say;
- -- They will be time-conscious and learn as quickly as you can communicate the material;
- -- They will be task-motivated ("How can I do this better?") instead of hurdle-motivated ("What do I have to do to please this teacher and get an 'A'?");
- -- They will force you to work with actual writing tasks, substantially different from the artificial tasks you have to create for your students;
- -- They will, in many cases, be dealing with you in a one-to-one tutorial situation;
- -- They can provide you with immediate feedback on how well you are understanding their needs and how well they are understanding your materials;
- -- They will, most often, bring to the learning experience greater sophistication and greater interest than the majority of your conventional students, most of whom take your course because it is a requirement.

Consulting, then, can be an exciting teaching and learning experience in itself. Instead of purchasing new texts and searching for new gimmicks, we can absorb new teaching experiences and experiment with new rhetorical tasks.

Beyond the pay and the revitalizing teaching experience, there is also knowledge to be gained and used. As consultants, we cannot fail to gain new insights into the way the rest of the world functions. Although we will not become educated in the Law or in business practices, we will have a better understanding of what it is to be a lawyer or a person engaged in business. Since many of our students are headed for professional lives, we would be better equipped to prepare them for what they must cope with after graduation. It is one thing to know how best to construct a sentence or a paragraph; it is another to know how to construct it so that it best fits the task (or the senior partner) at hand.

Our broader perspectives would gain us greater credability with our pre-professional students, which in turn might make them more receptive to what we have to teach them. To illustrate: I teach in a University where two thirds of the Freshmen now declare themselves "Pre-Med" and something like 85% of the Seniors go on to further education. My wife, who is a Neuro-biologist, has given me a fascinating set of electromicrographs of diseased lung cells, some thirty of which I have used as office decorations. Every semester there have been six or seven Pre-Med students who have come into my office with a clearly condescending v of English professors, who have been stunned by the presence of these sci c photos (they consider them "real" knowledge), and who have left havin ed attentively to what I had to say about writing. I know almost nothin t lung cells and yet have reaped benefits merely by association; can y agine what kind of effect actual knowledge of the "real" world would have on our chillingly competitive, Economy-conscious students? Indeed, are they not justified to some degree in listening harder to the teacher who has had the broadest range of experience?

From taking consulting jobs, we can expand our own knowledge, get more in touch with the worlds for which most of our students are preparing, learn new teaching skills, have enjoyable and fruitful teaching experiences, increase our credability with our students, and receive substantial extra compensation at many times the rate of our University employment -- and all this can be done with the expenditure of only a few hours a week, perhaps even less. We can help people in the professional world do their jobs better, become better teachers ourselves, and reduce our personal financial burdens all at the same time. We can deliver a service whose time, the professional world now thinks, has come. We have always recognized its importance: they are just getting around to it.

To accept good wages for doing this useful work is also to accept the challenge of doing it well. "Accountability" is the name of their game, and the incompetent are not rehired. We cannot afford to retain teaching methods that do not work or business practices that are sloppy. I think it is time that we as professionals learn how to be comfortable in the offices of other professionals, as we bring our individualized form of continuing education to them instead of having them come to us.

Is this a form of Prostitution? I think not. We have here no mirage of interpersonal relationships and promised satisfactions, sold by one who knows the delusion and bought by one who embraces it, leaving the purchasor empty-handed when the seller departs. In consultantships we are forced to deal with the realities of the interworkings of thought and expression of thought, all the while being highly conscious of the interpersonal relationship between professionals expert in their own fields. We have to remember that writing is the most intimate of all forms of personal expression, which necessitates the greatest degree possible of delicacy, accuracy, and awareness in the processes of criticising and teaching. The benefits we can provide our clients should not fade away when we depart, for we shall have taught them techniques which they can use to improve their writing permanently Many of these members of the "outside world" already appreciate what we can do for them. It is time now that we convince ourselves of our own legitimacy.

Panel I-15

Practical Applications of Technical Writing

PRACTICAL APPLICATIONS OF TECHNICAL WRITING: APPLICATIONS FOR TEACHERS

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For some years now, the teaching of technical writing has been getting increased attention from those wh^ once hardly noticed it, never mind valued it. With that increased attention has come a new sense of respectability and strength for teachers of technical writing. But with that attention has also come some danger -- danger that we will court this respectability and strength to the detriment of what we should be about, namely, developing writers who can function well in the "world of work."

During the last five years or so, technical writing has become an ever more significant element in national meetings centering on written communication. No longer the sole preserve of the Society for Technical Communication, technical writing has become a more significant element in national CCCC meetings, and has even found place in that "holy of holies" the Modern Language Association's national convention. Some teachers of technical writing have found in this recognition a new respectability and stature. Others have taken it as an index of the technical writing's growing strength in the profession. Articles that "flex" the "muscles" of this burgeoning strength have thus begun to appear in various technical writing journals. Their message is usually simple and direct. Translated into a pattern borrowed from the woman's liberation movement, that message essentially is: "I am technical writing, hear me roar!"

And the "roar" in the journals echoes on many campuses throughout the country. Whereas once technical writing seemed a poor orphan begging shelter from whichever academic department would take it in, now rich in potential, technical writing has to fight off academic suitors. Meetings and journals debate whether a scientific or technical unit or an English or humanities unit is technical writing's best campus home. Previously ignored by the one and even disdained by the other, technical writing is now the "child of grace" to both technical and humanities units. Flattered, teachers of technical writing thus engage themselves in what may well be a worthy debate about the administrative home for their discipline. But there is danger.

Flattered by their new respectability, and wanting more of it, teachers of technical writing likewise find themselves rubbing shoulders at meetings and in journals with those who once disdained them. Looking for new outlets for their energies, scholars who once could think of nothing but literature's "pleasure dome" now engage teachers of technical writing in debate about "heuristics" for technical reports on the "geodesic dome." Others urge teachers of technical writing to debate their sense of writing as "product," and work to understand writing as "process." These new associations may well enhance the teaching of technical writing. But there is danger.

The danger in both the administrative and the teaching "debate" is that they will ultimately consume us. They may deflect our attention from what we should be about -- developing writers who can function well in the "world of work." For even before we discovered this new strength and these new friends, we had not yet "arrived" on the matter of developing technical writers who could function easily after graduation in the "real world" of business and industry.

Teachers of technical writing cannot long afford the luxury of "academic" concerns, for as William McGarron reminds us, "the day to day business world of technical writing is not quite the ivory tower world of the college or university" ("Confessions of a Working Technical Editor," TWT VI 1978, 5). Evidence is clear already that many technical writing students experience what Dennis Karwatka terms "shock" when they "transfer from school to the real world of work" ("Confessions of a Technical Writer," TWT I 1974, 6). Perhaps R. John Brockmann comes closest to the truth when in a very recent article he insists that current "teaching practices . . . are insensitive to students' career needs because they are based on mistaken notions concerning writing and the process of communication" on the job. ("Taking a Second Look at Technical Communications Pedagogy," JTW&C 10 1980, 283).

Rather than congratulating ourselves for our new stature among teachers of writing and now even trying to emulate some of their methods, therefore, we teachers of technical writing must always measure the worth of our pedagogy against the needs of writers in business and industry. "Practical applications," as the title of this paper calls them, of technical writing should be our paramount concern.

But what are those needs? How well aware of them can we be when graduates of our courses are "shocked" as they enter the world of work? How well can we meet them by following some recent advice about making changes in our pedagogy?

Current articles in the technical writing journals suggest that teachers of technical writing turn to modern rhetorical studies for guidance. And while there is danger, they make some sense.

Basically the new thrust calls attention to "process" in technical writing and away from sole concern with "product." Some, like Dennis Hall, find that "Technical writing generally enjoys a healthy orientation to the objects of the writer's attention as the source of materials for writing, but neglects invention as a distinct and deliberate system in its passion for form" ("The Role of Invention in Technical Writing" TWT IV 1976, 21). Hall and others insist that "discovery of purpose . . . precedes any consideration of structure and style, indeed determines them" (Hall, 21) in good writing, technical or otherwise. Like Fred Mac Intosh, these critics of traditional approaches to technical writing ask teachers to "approach writing as purpose rather than form and format" ("Where Do We Go From Here," JTW&C 8 1978, 139). Reflecting on traditional pedagogy, they criticize the conservative nature of most technical writing textbooks and their concentration on "product" skills. With R. John Brockmann, Jack Seltzer, J. W. Allen, and Carolyn Miller, among others, adherents of this new thrust wish to expand traditional concern for form -- sentence and word length, grammar, and punctuation -- to include understanding of the process of creation and of cognitive psychology. They no doubt offer us much.

But this new emphasis on "process" in teaching writing, however valuable, cannot be allowed to deflect attention from the demands of the "world of work." Some ways have to be found, in fact, to test both the traditional "product" assumptions and the new "process" suggestions of those concerned with teaching technical writing against the needs of writers in that "real world."

Back in 1975, Richard M. Davis told us that "As the field of technical writing comes of age, we must develop our own basic research projects aimed at attaining objective evidence about the effectiveness of particular forms or kinds of communication in given institutions." In Davis' strongest terms, "we must determine not only what is, but what ought to be" ("A Modest Proposal," TWT II 1975, 3). But, unlike our college and university colleagues in science and technology or literature and rhetoric, we cannot accomplish this research in the relatively isolated world of campus or in great university research laboratories and libraries. However valuable such research for others, it is doomed to be inadequate for teachers of technical writing simply because it is done in isolation from the world of work.

Teachers of technical writing must do their research as John A. Muller tells us "Out in the field, (where) we can test our genius against public and publicly defined measures of success" in communication. Such research out in business and industry makes "the world of work a laboratory" in which to test and question our present practices, and those now being proposed in the journals. If we remain "cloistered in the classroom," according to Muller, "we tend to consider not these more productive questions but questions of fad, fashion and worse" ("What Consultation and Freelance Writing Can Do for You and For Your Students" TWT V 1978, 75-6). Trivial questions and debates, in fact, will never produce what we need so badly -- a rhetoric of technical communication.

To this point, however, teachers of technical writing have done little such research and we have no "rhetoric of technical communication." As a discipline, we are "failing to identify problems that need solving" since in Paul V. Anderson's words, we "uncritically" accept "a large number of beliefs about teaching technical communications . . . many of which are highly debatable" ("The Need for Better Research," JTW&C 10 1980, 275). We may feel comfortable with the partial truth invoked by traditionalists like John H. Mitchell that "an expected pattern communicates better than a random pattern" ("It's a Craft Course: Indoctrinate, Don't Educate," TWT IV 1976, 2). In our comfort, we may then feel secure emphasizing grammar, usage, mechanics, diction, word or phrase counts, and other stylistic elements. We may continue to use technical writing textbooks, often mirror images one of another and little changed in some years. And, if we do, we will continue to send students out to the "real world of work" who can only be "shocked" by their lack of preparation.

Now, I seem to have placed teachers of technical writing between a rock and a hard place. On the one hand is the Scylla of the "new rhetoric" proposing an emphasis on "process" in technical writing courses. On the other hand is the Charybdis of the "old approach" stressing continued emphasis on "product" in technical writing courses. What's to be done?

Well, what's to be done is to pick up on Davis' advice in 1975 to determine by systematic research "not only what is, but what ought to be." And that research has to be done in what Anderson calls a "naturalistic" setting -- in the "real world of work."

To create a comprehensive "rhetoric of technical communication," teachers of technical writing will have to become "natural investigators" who as Anderson says, "prefer the natural setting because they are interested in studying phenomena, not in isolation from all other potentially confounding variables, but in the presence of all the conditions that are normally present" in business and industry. Unlike traditional researchers into the teaching of technical writing, natural investigators will "formulate hypotheses and identify variables during (and not before or after) their studies" ("The Need for Better Research," 279). They can thus test the traditional product emphasis of technical writing textbooks and teachers. They can also assess the value of the new "process" emphasis proposed as one solution to the disparity between writing taught on campus and writing done in the "real world." This research will be more immediate and more reliable than traditional surveys of "what business and industry want" from their writers -- surveys that leave researchers isolated on campus and that leave people in business and industry, out of touch with developments in the writing field, to reaffirm traditional but apparently ineffective approaches to technical writing. They will also be more effective than listening to representatives of business and industry talk about what they do or what prospective employees of their establishments will need to be able to do as writers. However valuable their perspectives or advice, they are no substitute for teachers "informed" regularly by their research in the "real world of work."

But how are hard-working teachers to do this research? John A. Muller proposes, quite simply, that they do it through consulting and freelance writing. In Muller's words, "Every assignment you accept off-campus does for you what library research does for 17th Century colleagues. You become more broadly educated in science and technology, not any expert perhaps, but certainly a more competent generalist. You certainly become a more expert inter-disciplinary translator and communicator, and that is what you are about in the classroom." In consulting and freelance work the problems will be exactly those that the students in technical writing courses will someday face. Muller is surely correct when he insists that "by working in their world, you will discover their needs, develop tested methods of solving real problems, and earn both respect and credibility" ("What Consultation and Freelance Writing Can Do for You and Your Students" TWT V 1978, 75). In short, teachers, like students of technical writing, need "internships" beyond the classroom similar to those proposed in the technical writing journals by people like Anderson, Appelwhite, Kelton, Losano, Mathes, Pearsall, Stohrer, Whitburn, and Wyld, among others.

If off-campus opportunities are limited, and at times they are, a taste of the "real world" can be had in the technical and business areas of most colleges and universities. These on-campus locations that have often been used for student interns -- business offices, publicity offices, publication offices, science and technical departments, etc. -- can likewise accept us as interns and researchers.

These off-campus and on-campus "real world" sites will give us experience of great benefit not only to us and our students, but in the end to the profession generally. As Wayne Losano points out, they can "strengthen the faculty's relationship with industry and with other segments of the academic community, . . . help faculty to adjust the (technical writing) program to fit the realities of industry, . . . and provide a means of measuring our effectiveness as teachers of technical writing" ("Internships in Technical Writing, On and Off Campus" TWT I 1974, 5-6).

But in my view, "naturalistic" research in the "real world of work" can help us to do even more. It can help us establish that "rhetoric of technical communication" we so clearly need. The "real world" experience should help us sort out, for example, the sometimes conflicting demands of those who would have technical writing teachers emphasize "product" and those who would have us emphasize "process." It may likewise provide us some resolution for the debate about a proper "home" -- technical or humanistic -- for technical writing courses and programs. At present, we are often occupied in our meetings and journals with these two "debates." While it may be as Paul Anderson suggests, that "the teaching discipline lives to debate, but not to investigate" (275), in this instance only naturalistic investigation -- research in the "real world of work" -- is going to resolve the questions that currently vex the teaching of technical writing, and most significantly is going to prepare our students as technical writers who can enter the "real world" not only without shock, but with ease.

They will enter with ease because our strength and respectability -- and theirs -- will be derived not merely from the increased attention we are receiving in academe, but from the increased attention we have given to the real needs of writers in business and industry. We will have developed, through naturalistic research, a realistic rhetoric of technical communication -- one that has practical applications.

A PROCESS PARADIGM:

WRITING CASE ANALYSES FOR ORGANIZATIONAL BEHAVIOR

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## INTRODUCTION

My paper now looks like a case study in recursive revision. I have been repositioning, even regenerating, ideas for an audience which did not concretely exist before the meetings of the past few days. Here at the very end of this conference, I had intended to demonstrate what takes place in a case analysis writing workshop for beginning Management students which I've designed collaboratively with their faculty. I wanted to show what we've discovered to be an effective way to teach 'the non-sequential process' of analytical writing to 'novice writers' by emphasizing what seems to be a 'basic process that underlies all composition.' The echo of phrases from yesterday's speakers on The Composing Process in Technical Writing is only partly contrived. I speak directly to the shared concerns of this year's conference: as teachers of writing, we are now able to identify the stages of the composing process well enough to teach them effectively, even to students who are inexperienced writers.

Inexperienced students, as they come to us at Bentley College, are very unready for the discerning forms of technical communication Mr. Saft and Mr. Lewert have just spoken of in their respective industries. More are comfortable with quantitative than verbal analysis (a 300 point spread between high math and low verbal SATs is not unusual among them), but it is less their lack of fluency with words than their static treatment of ideas which prevents these students from thoughtful, let alone technically effective, communication. At best their writing lists (or quantifies) information without interpretation. Thus, since they cannot use writing for discovery, they have no access to the power of analytical thought.

My work with these students and their subject area professors is so fundamental that I was surprised to find this presentation grouped with "applications " of technical writing. Neither my own background nor the teaching objectives of the Bentley Management faculty are particularly "technical." My credentials for managing a business college writing center are medieval literature and one-to-one work with basic writers. From literary studies I bring the ability to recognize, describe, and see the significance of complex patterns of relationship; from tutorial work, I bring the ability to meet the minds of others, to understand why their analytical processes are blocked, and to help them move toward better understanding and communication. Although my colleagues' backgrounds are more technical--the particular group I'm concerned with here teach Organizational Behavior--their goals for students are similar to mine. We have worked together for three years to design a process-based writing workshop which will introduce students to the basic tools for sound creative analysis.

The outcome of our collaboration is a workshop session featuring a variable-sequence process model and highlighting an original heuristic that really helps students explore and write Case Analyses for Organizational Behavior (O.B.). Participating faculty and tutors reinforce the approach with students after the workshop. In the writing center, we find the approach can be applied to any analytical writing 'basic' students undertake, but this is partly because of the paradigmatic nature of O.B. Case Analysis as an academic exercise. Before demonstrating the workshop tools, therefore, I will be exploring their genesis in the creative dilemma of O.B. Case Analysis, as that form of discourse is understood at Bentley.

## ORIGINS AND RATIONALE OF THE WORKSHOP

To those professionally trained in technical disciplines, I have discovered, Case Analysis may mean a great many different things, some of them precise, single-messaged, and technical. Fortunately for the writing process workshop, however, to the Bentley Organizational Behavior faculty the form is an open, creative, and exploratory one. This is as much due to this group's understanding of its discipline as to its pedagogical purposes with the students I've described. As a discipline, Organizational Behavior studies the forces and dynamics which govern human interactions. Insights from sociology and psychology have been pulled together into various "conceptual schemes" for exploring how people behave--one-to-one and in the small and larger groups that form for work or other purposes in corporations, factories, universities, and other organizations. The ultimate aim is to help organizations bring out members' full human potential (and, of course, productivity). O.B. conceptualizers keep striving to develop schemes which will take into account the full human complexity of any given situation and the full dynamics of changing it. "Explore" is a key word, because the discipline strives for creative insight into the little-known, rather than the tallying of known and predictable factors.

There are a great many styles of teaching O.B., but all use cases to illustrate new concepts and to test and explore them. There's a sample case in my packet of materials which you might want to look at as I talk. "Mr. Hart and Bing" was originally published by the Harvard Business School in 1943 when the genre (and the field) was new. It is still used in textbooks and courses and is the exemplary case in our workshop. O.B. cases are detailed narratives (put together by trained case-writers) of complex workplace situations where a variety of motivations, factors, forces, structures, and incidents have produced a tangled web of human interactions. There is often a story line in which a protagonist (or antagonist) develops complex, disfunctional relationships within a group. The plot reaches some kind of climax, then abruptly breaks off without resolution. Closure is the job of the analyst. The case of Mr. Hart and Bing shows us a particularly vitriolic dispute between the foreman of a work-group which inspects electronic panels and one of the group's five members. A company counselor narrates each man's perception of the situation: Mr. Hart, the foreman, has found fault with Bing's practice of carrying two or three panels at once to the inspection station, then charging double or .iple time. Bing defends his practice. Insult escalates to a high pitch.

Because of the ambitious and exploratory nature of the discipline, O.B. case narratives strive for the kind of "richness" of phenomena which characterizes literary works. There is a great deal of detail in this case that might not seem directly functional in illustrating textbook concepts: both Bing and Mr. Hart, for instance, express themselves in revealing metaphoric language. One feels the other watches him "like a hawk"; that one, in turn, feels he must handle "that bird," who is supposed to be under his governance, "with kid gloves." Though neither protagonists nor case writer are deliberate poets, the powerful images of falconry hover behind the insults. And there are sexual, perhaps Oedipal, dimensions to the discourse as well. O.B. cases are solidly grounded in phenomena that aren't always patently illustrative. In this case, the phenomena create a very compelling image of turmoil rather than a series of clues to support a built-in analysis. I think case writers, like poets, aim for an artifact that will outlast the reigning critical dogma and will be interesting to generations of O.B. analysts (as this one has been) because it represents a genuine and recurrent human struggle--we literary critics might call it mythic--in all its complexity. "Mr. Hart and Bing" is shorter and perhaps more mythic, more resistant to easy conceptualization, than is typical, but it gives a good idea of the richness and complexity of the situations O.B. students are asked to analyze.

Teaching practice in Organizational Behavior uses two genres of case analysis: collective, oral exploration through class discussions and private, written analysis. In discussions, cases serve as the phenomenal ground for group exploration of instructors' various conceptual schemes. Some instructors use "Mr. Hart and Bing" when studying the personal "background factors" (including Maslow's needs-hierarchy) which affect people's working lives; others use it to explore concepts of leadership or of communication (see F.J. Roethlisberger's classic 1953 Harvard Business Review article, "The Administrator's Skill: Communication"). Such class discussions (I've visited a few) are rich and mind-stretching, rer ent of good literature classes where a dynamic instructor generates ener d questions that help students learn creative exploration.

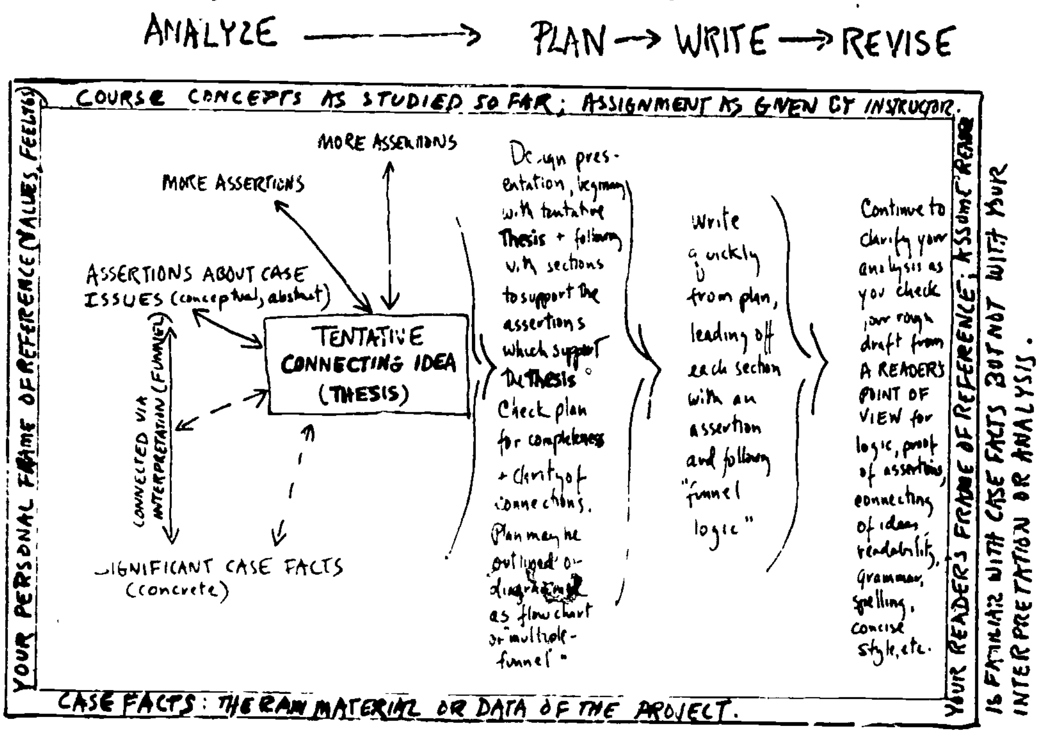
In written case analysis, the pedagogical goal is, again, discovery, but the exploration must be undertaken independently. An assignment on "Mr. Hart and Bing," for instance, would be open-ended: 'Using course concepts, analyze the case of Mr. Hart and Bing to suggest why their difficulties may have arisen and what kind of action might be taken to change or improve the situation." Accustomed to summary or list-like formats for "thinking," the students panic. In O.B. Case Analysis at Bentley there are no formats given to simplify (or short-circuit) their discovery process. Their professors want a genuine, original, wrestling-with-the-complexities analysis. Of course there are always a few students who, like the professors, seem to have a gift for analysis: for them, patterns of effective discourse are "melted into the brain" as previous speaker Stephen Saft put it. But most of our students, who lack the models for sustained and coherent analytical thinking in their personal backgrounds, flounder into either plot summary or grotesquely oversimplified and under-supported generalization. The logical process of analysis seems unteachable and unlearnable. Yet the apparently unteachable analysis of complex information is key to all the professional activities of the adult world.

Traditionally, individual professors have offered their own, greatly varying, step-by-step process prescriptions (interesting clues to what I take to be their own composing processes). The Bentley O.B. group, however, decided to undertake a more universal teaching approach by working with a writing specialist. First we collaborated on a step-by-step handout which incorporated everyone's ideas. By the time consensus was reached, the document was two pages long and highly prescriptive. Wisely, the group rejected its own creation as a process-sequence for students. It was too highly regulated to encourage the flexibility of process which they saw as essential to the creative analysis they wanted students to learn. But the collaboration had identified the essential operations of the analytical process, and it was possible to generalize these into a less rigidly sequential model which would help us understand and address the blocked processes of students. The model we developed for the workshop, like the Flower/Hayes and other process models discussed yesterday, is not built on a fixed series of steps but on a pattern of thinking which underlies both discovery (analysis) and presentation (paragraph writing). It is the visualization of this pattern of thought--an original heuristic, the Abstraction Funnel--which is most effective with students. The funnel makes accessible to students a very common set of logical relations, which most have already at their finger-tips but don't know how to use.

## FEATURES OF THE WORKSHOP

The remainder of this paper will introduce both the model and the Abstraction Funnel to give an idea of their usefulness. We don't use workshop time to develop the full implications of the process model, which is more useful to experienced than to inexperienced writers (detailed discussion is effective among ourselves or with graduate students). For sophomores it merely suggests the complexity of a process they usually assume to be simple, and helps them locate the sources of inadequacy in their own work. We introduce the model as a chart, with characteristic examples of the unsuccessful extremes of case analysis: <u>either</u> uninterpreted case facts ("story-telling") or unsupported assertions about course concepts. The chart shows the overall process by which experienced writers avoid such extremes.

ILLUSTRATION 1 PROCESS MODEL FOR WRITING CASE ANALYSES

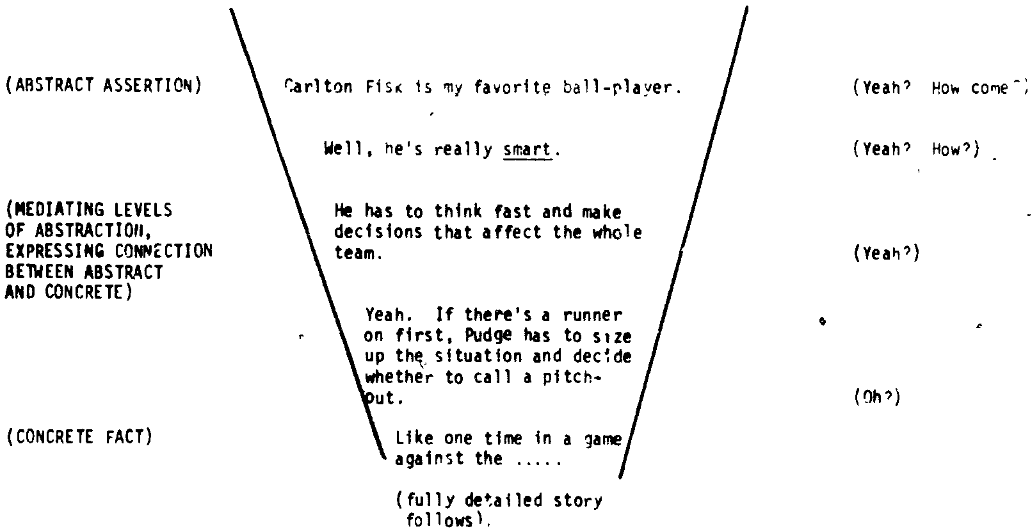



The difficulties with inadequate student attempts, we are able to show them, lie not in the writing stage itself, but in the methods used earlier in analysis and planning (and also in the final stages of revision as thinking is fully integrated and clarified.)

We turn our attention then to what the chart indicates the crucial process of analysis is. Some people, we say, begin effectively by collecting significant case facts and proceeding inductively; others work best by beginning with abstract concepts (course concepts, in O.B.). For most of us, a combination of inductive and deductive reasoning is most effective, as is indicated by two-way arrows on the chart. Since these logical terms lack operational force for our students (indeed, their inability to understand what it is to move between abstract and concrete is what we identify as their root difficulty), we offer the Abstraction Funnel as an all purpose tool for getting started with analysis, carrying initial hunches further, and designing the effective communication of an analysis.

We introduce and illustrate the funnel with a topic of common conversation (now of merely historic interest in Boston, since its subject has moved to Chicago).

ILLUSTRATION 2· SINGLE ABSTRACTION FUNNEL




We discuss several aspects of this simple demonstration: the role of the questioner (like a potential reader, always difficult for inexperienced students to imagine); the inadequacy of concrete facts without abstract significance (or of abstract statements without concrete substantiation); the function of connecting or mediating levels; the variability of process sequence. Many of us begin our <u>thinking process</u> at the concrete end, or the middle, of the funnel, yet the <u>communication process</u> works best starting from an abstract assertion.

Next we show how, in more extensive conversations, assertions are linked--at first loosely, then with more attention to precise relationships.

ILLUSTRATION 3· CONNECTED FUNNELS

Carlton Fisk is my favorite ball-player (Yeah? How come?)

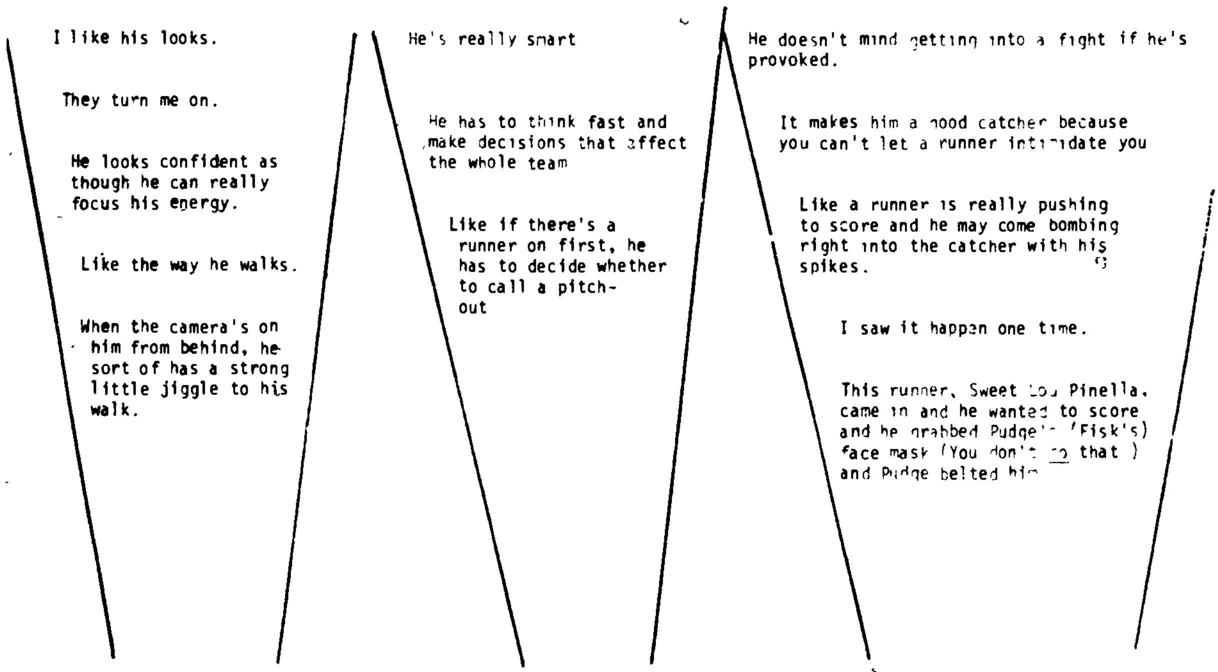
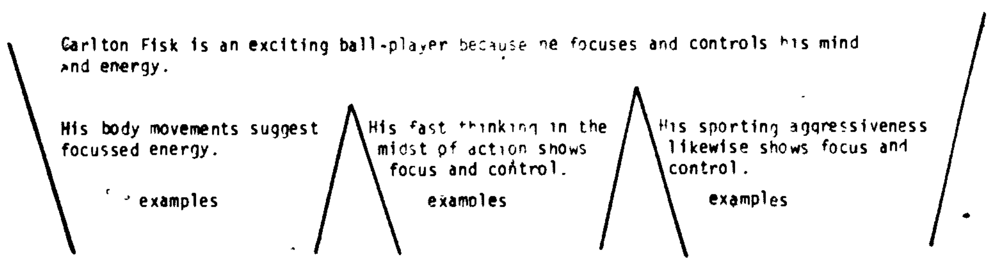



ILLUSTRATION 4 REFINED CONNECTION AMONG ASSERTIONS



From the conversational funnel it is easy to adapt a powerful tool for making responsible assertions about an O.B. case, and for linking those assertions responsibly. Our demonstration comes from ideas any O.B. student might have about "Mr. Hart and Bing."

ILLUSTRATION 5  A SINGLE FUNNEL EXAMINING ONE ELEMENT OF A CASE

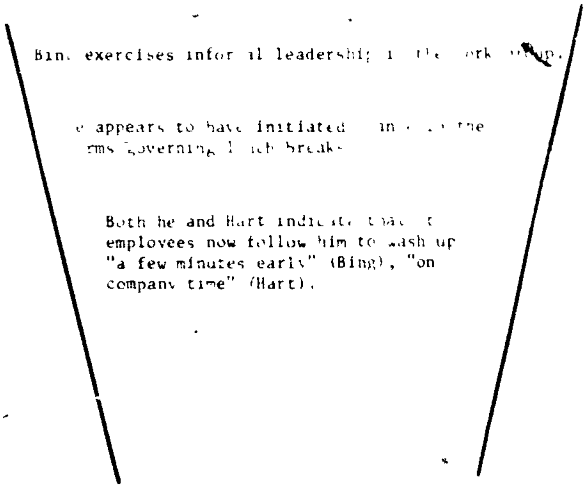
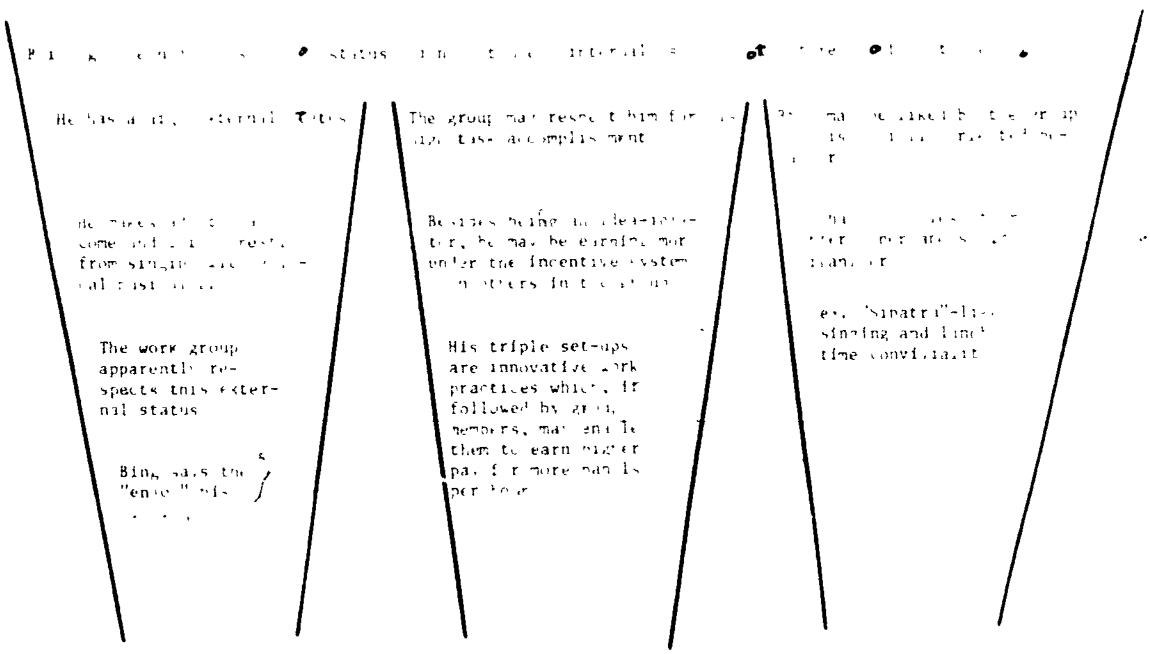
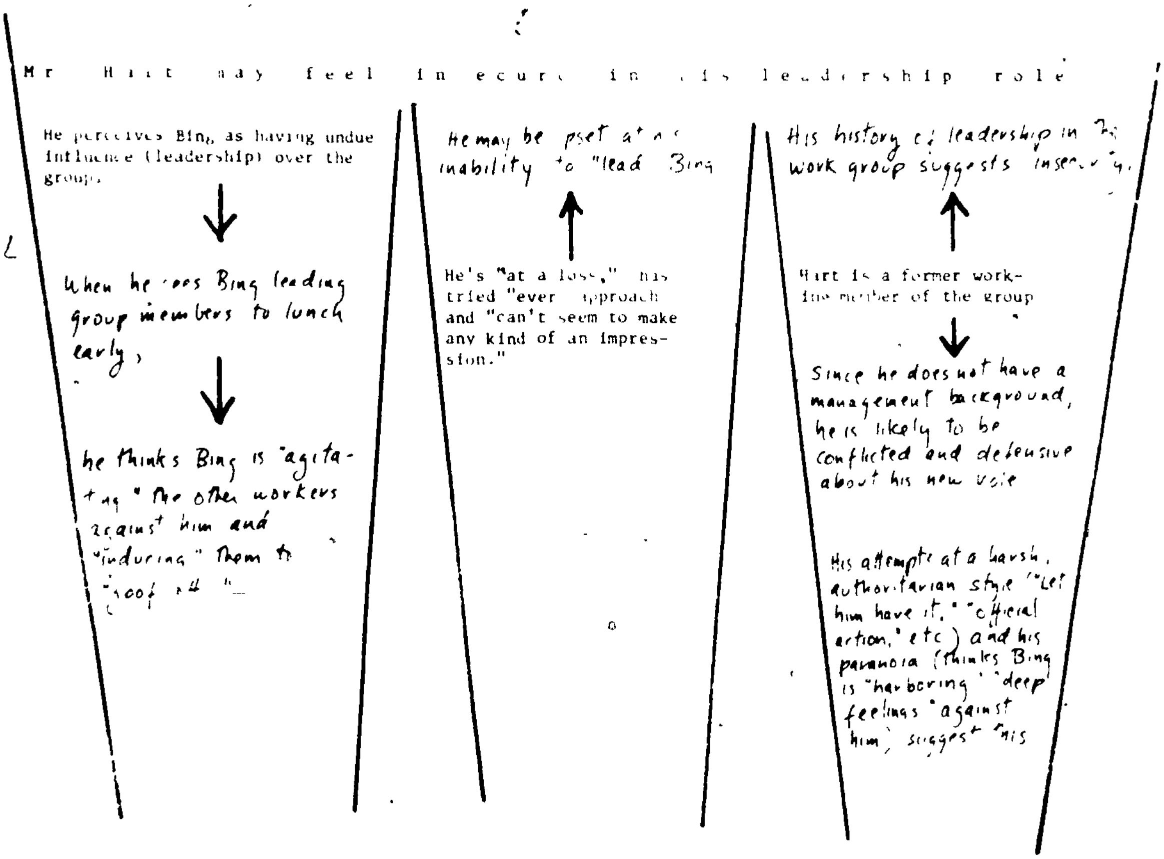



ILLUSTRATION 6  CONNECTED FUNNELS USING COURSE CONCEPTS TO EXAMINE SEVERAL ELEMENTS IN AN ASSERTION



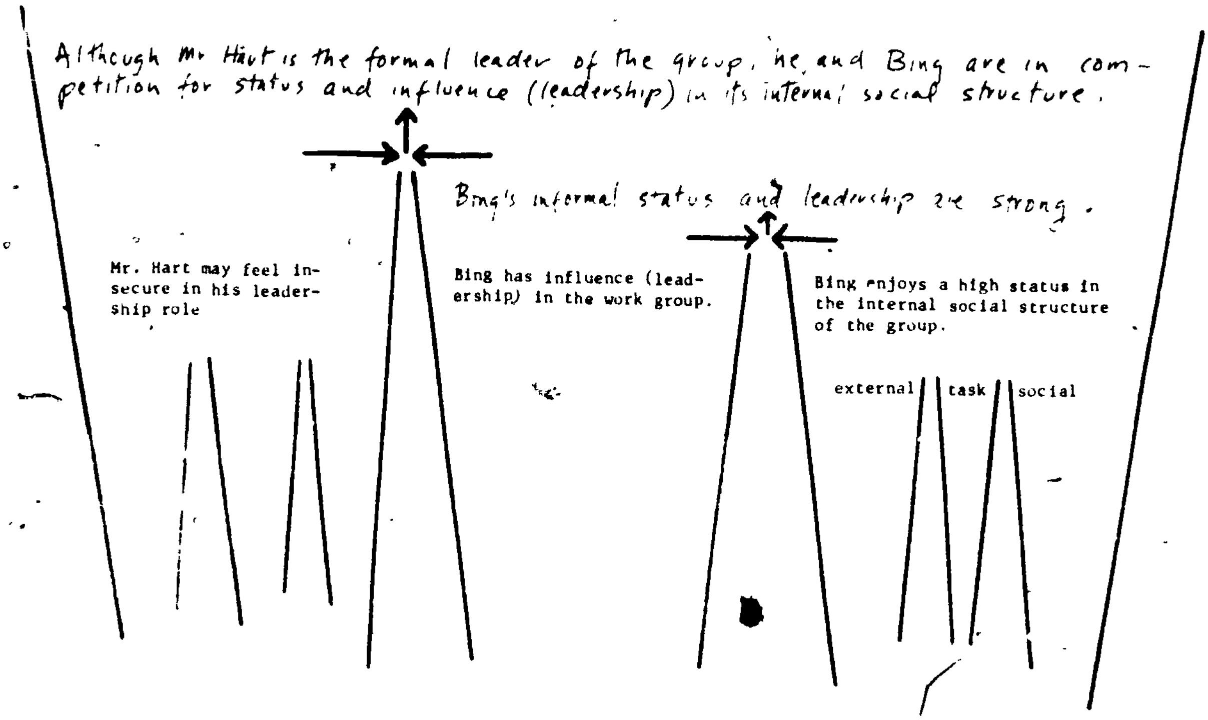
Finally we show some of the variations in sequence which may occur during analysis as different analysts respond to the constraints of different problems. One analyst may start by examining an assertion based on a course concept (or instructor's question). And within this procedure, insights may originate on various levels of abstraction. (Arrows indicate sequencing of handwritten insights, which are written, "live," onto transparencies during the actual workshop.)

ILLUSTRATION 7 COMPLETING A SET OF CONNECTED FUNNELS EXAMINING AN ASSERTION




The further effort of articulating relationships between assertions (and/or funnels) may lead to a discovery of a major connecting idea or thesis which was not perceived in advance.

ILLUSTRATION 8: CONNECTING SEPARATE FUNNELS INTO A MAJOR ANALYTIC ASSERTION




## SUMMARY AND IMPLICATIONS

The workshop ends here: the heuristic has merely been introduced and demonstrated. Learning takes place as students struggle to use the heuristic in their analyses of cases like "Mr. Hart and Bing." Both the Organizational Behavior faculty and my staff of student tutors continue to find new uses for the Abstraction Funnel. We now have a way to communicate to students what is missing in their analyses without giving the false impression that there is a simple, measurable, right way to think. The heuristic is sound because it enables both inductive and deductive processes and encourages recursiveness. The dynamic potential of the Funnel is clear when we compare it with the well-known Abstraction Ladder of S.I. Hayakawa: the Ladder expresses static, hierarchical arrangements of information or concepts: the Funnel, because it relies on predication (full sentences) at each level of abstraction, actually helps students <u>discover</u> ideas.

I don't expect the Abstraction Funnel to have any direct implications for technical communication in industry. It won't help future writers convince a skeptical public about the values of a certain pesticide. But I've realized today how significantly the purposes of academia differ from those of industry. As a teacher, I am proud to report that the Abstraction Funnel helps technically oriented students learn the logical analysis, creative problem solving, and effective communication which may help them to make and share sound decisions throughout their lives.

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16 Abstract

The 32nd annual meeting of the Conference on College Composition and Communication had 20 sessions with over 75 papers relating to various aspects of technical communication. The rhetoric and ethics of technical communication, recent developments in technical communication, pedagogical techniques, empirical research, courses and curricula, and business writing are the important subject areas represented.

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