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ABSTRACT
                The 34 papers in this volume discuss a variety of
technical writing topics. The following are some of these topics: (1)
definitions and historical analyses of technical writing; (2) using
case studies in technical writing classes; (3) advice to beginning
teachers on how to teach graphics in technical communication classes;
(4) preparing for an influx of foreign students in technical writing
courses; (5) enlightened use of the passive voice in technical
writing; (6) technical writing and the marketplace; (7) teaching
technical writing to native Americans; (8) new directions in
technical communications; (9) effective models and classroom
techniques for integrating oral communication within technical
writing courses; (10) a rhetorical analysis of the words, sentences,
and paragraphs in 16 industrial scripts; and (11) research in the
comprehension of engineering lectures by nonnative speakers. (PL)

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, technical 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 prepare a proceedings that can make current research available as quickly as possible.

In order to make this proceeding ... ful, authors of papers were asked to revise and develop the papers they ... lly gave. In addition, session chairs, associate chairs, respondents ... ecorders were encouraged to write papers or prepare coherent statements, ... 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.

J. C. Mathes
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Compilers

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WHAT IS TECHNICAL WRITING?
PROLEGOMENON TO A CONTEXTUAL DEFINITION

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INTRODUCTION

What is technical writing? The question is of more than formal interest since the various answers to it make different claims about the stance a teacher assumes in a classroom, the orientation of textbooks, and the shape of curricula.[1] Certainly such a question of identity is predictable, and even common, during the emergence of a discipline.[2] And, indeed, the question has been addressed often in the literature. But if technical writing is now a discipline in its own right, if it has in fact "come of age," if definitions abound, then why ask the question again?[3] Precisely because technical writing is of age and definitions abound, the time is ripe for a metaperspective on the question. The purpose of this paper, then, is not to offer yet another definition of technical writing but, based on an analysis of pitfalls in representative definitions, to suggest a direction for future inquiry.

PITFALLS

Past attempts to define technical writing have been found wanting. A common pitfall has been a failure to recognize the biases implicit in the use of the term "technical writing." For the term itself is laden with definitional assumptions. Thus, the constituent term "writing" implies a privileging of the written word, a privileging which is ultimately seen as unwarranted: John S. Harris laments the bias in using this term and the attendant devalorization of the oral and the graphics modes; in this spirit, he proposes substitution of the word "communicator" for "writer."[4] The constituent term "technical" is also fraught with terminological difficulties. We can't seem to agree on what "technical" means. Should it imply subject matter? A manner of treatment? And even if we could agree that "technical" implies subject matter, to take a case

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common in the literature, we can't seem to agree on which subjects are "technical" and which are not. Thus, Mills and Walter endorse a definition based on subject matter but ultimately express a general reservation about its validity: "Although one of the obvious characteristics of technical writing is its technical subject matter, it would be very difficult to say precisely what a technical subject is."[5] Perhaps the term is too narrow. Harris, for example, sees the need to broaden it.[6] Perhaps the term is too broad. Carolyn R. Miller would have it narrower: She sees the need to distinguish between "scientific writing" and "technical writing."[7] The problem of terminological bias is compounded when the terms selected are too closely linked to a contingent historical reality. The term "Engineering English" or "Writing for Engineers" arose, for example, because technical writing was originally offered as a service course <u>for engineers</u>.[8] Similarly, recognition of the increasing diversity of majors in technical-writing courses may underlie the recent appearance of such terms as "Technical and Professional Writing."

A second pitfall in definitions of technical writing is epistemological in origin. That is, every definition of technical writing carries assumptions about the nature of reality and these assumptions are problematical, especially when linked to an outdated epistemology. Returning to our earlier example of definitions based on subject matter, we noted objections on the grounds of fel's terminological difficulties. Miller offers an objection to such definitions on <u>epistemological</u> grounds:

> Definition based on content seems at first obvious and then unworkable—no one is prepared to say which subjects are "technical." Engineering, certainly; science, of course; but linguistics? political theory? seventeenth-century music? urban planning? <u>Reality doesn't come in packages clearly marked "technical" or "nontechnical."</u> [emphasis ours] [9]

Nor are Miller's objecti... confined to definitions based on subject matter. She argues convinci... that textbook definitions of technical writing based on style, tone. or form as well as on subject matter are suffused with the legacy of a discredited epistemology, scientific positivism.[10] Surely one who entertains a post-positivistic view of knowledge will object to definitions such as the following: "Though subject matter and form are questionable bases on which to define technical writing, philosophic position is still a sound basis.... [T]echnical writing is concerned with demonstrable truth."[11] (But, counters our hypothetical post-positivist, knowledge is <u>created</u> and consensually validated, not <u>found</u> in an objective external reality.[12]) Or: "Our definition of technical writing [is] writing about a subject in the pure sciences or the applied sciences in which the writer informs the reader through an objective presentation of the facts."[13] (But knowledge is intersubjective, rather than objective, in nature.) Again: "The primary, though certainly not the sole, characterist... of technical and scientific writing lies in the effort of the author to c...vey one meaning and only one meaning in what he says."[14] (But there is not a one-to-one correspondence between words and reality.) Lastly: "Technical writing is expected to be objective, scientifically impartial, utterly clear, and unemotional."[15]

(But science is a rhetorical act.)

Other pitfalls in attempts to define technical writing trace to methodological biases. Specifically, examination of many such attempts reveals de facto predispositions toward monism, binarism, and ad hoc modelling; the attendant misuse of these techniques often provides the bases for subsequent challenges. Monism is evidenced in the view of technical writing as unified, monolithic, and singular--as "all of a piece." However, such conflation, commonly underlying early definitions, is felt to mask the diversity and richness of writing in the field.[16] Monism is heightened, of course, when technical writing, conflated to an idealized entity, is associated with a single property, e.g., stylistic simplicity. Criticisms of such monism implicitly acknowledge the diversity of technical writing by countering examples given with others drawn from elsewhere in the field. If a user manual was cited to evidence stylistic simplicity, one counters with, say, a metatheoretical discussion of stochastic processes. Similarly, if Proust's writings were used to exemplify stylistic complexity of literature, one counters with a passage from Robbe-Grillet.

Another methodological pitfall in defining technical writing originates in the weaknesses of binary opposition, or binarism. Binarism is the setting up of an opposition on the basis of a differential property--in the simple case, on the basis of the presence or the absence of that property. The preference for binarism is understandable: As Jonathan Culler notes, "[binarism] can express any of the relations that could be handled in other terms and leads to a simplification of both framework and description...."[17] But the strength of binarism is also its principal weakness, i.e.,

> ...[binarism] permits one to classify anything. Given two items one can always find some respect in which they differ and hence place them in a relation of binary opposition.... What it organizes are qualitative distinctions, and if those distinctions are irrelevant to the matter in hand, then binary oppositions can be very misleading, precisely because they represent factitious organization."[18]

An example might be helpful here: Harris considers the argument that technical writing is not metaphoric, whereas poetry and novels are. His refutation is in part on methodological grounds: Such an argument must "ignore the essentially metaphorical basis of language itself..."[19] Note that Harris is claiming, in effect, a factitious organization based on a misleading binarism. That is, since language is based on metaphor, and both technical writing and literature are based on language, a distinction based on the presence or absence of metaphor cannot be significant. He continues by adopting the tactic typically used to expose misleading simple binarisms, that is, one either shows the presence of a property supposedly absent or the absence of a property supposedly present. In this case, Harris cites numerous examples of metaphors widely used in technical writing.

The binarism propounded above was misleading because the distinction

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on the basis of the presence, and alleged absence, of a property was
invalid. More representatively, a binarism is misleading when the
disjunction on the basis of a qualitative difference in a property is
factitious. We return to an earlier example and consider the claim, as a
possible basis for defining technical writing, that it is stylistically
simpler than other discourse.[20] Suppose that, in support of this claim,
an excerpt from a user manual has been contrasted with a passage from
Proust. To counter, one contrasts a metatheoretical discussion of
stochastic processes with a passage from Robbe-Grillet and the disjunction
collapses. In the final analysis, technical writing may well be
stylistically simpler on the average than literature, but the overlap is so
great that the proposed organization is surely factitious. Moreover,
technical writing cannot be distinguished from all other discourse on the
basis of a contrast with literature alone; hence, even if valid, the
contrast could not establish the distinctiveness of technical writing. In
more classical terms, the methodological defect is inadequate sampling.

A related class of methodological pitfalls occurs when the assignment
of properties used in defining technical writing is unsystematic, or ad
hoc. To illustrate: Rejecting previous definitions of technical writing
based on subject matter, Keith N. Hull wishes to expand the definition "for
the simple reason that technical writing is a broader mode of discourse
than that carried on by engineers and scientists."[21] Noting that his
course has "twenty-two students from eleven majors" and that "only half of
these are engineers or scientists," he then asks: "How in all honesty can I
define technical writing in such a way as to exclude half of my
students?"[22] We would note that any definition of technical writing which
must accommodate the contingent reality of the composition of a given class
at a given time in a given place is clearly open to a charge of extreme ad-
hocism. Hull's more formal definition of technical writing avoids such
extremism, but the element of the ad hoc persists. His general definition
of technical writing rests largely on a list of selected properties whose
theoretical basis remains obscure.[23] Hull is not alone; textbooks are
rife with definitions based on some collection of characteristics which do
not evidence a systematic approach and may, therefore, lack descriptive
adequacy.

Not that descriptive adequacy alone will suffice. Problems remain when
the properties assigned to technical writing are too empirically derived.
Considering attempts to define technical writing in terms of form--an
implicit definition informing the many textbooks organized on the basis of
report genre--Harris notes that "any definition by form or format will
almost immediately become obsolete as new forms and formats appear."[24]
Rather, we say that any definition reflecting a too slavishly empirical
view of form is unworkable, that is, a definition must have validity beyond
a fixed, extant corpus of materials. Though restricted to form, our point
has wider applicability. Definitions which have merely descriptive
adequacy, and only narrowly conceived descriptive adequacy at that--in
short, definitions which lack generative qualities--are short-lived.

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CONCLUSIONS

Such, then, are some of the pitfalls in representative attempts to define technical writing--pitfalls which have been shown to provide the bases for subsequent challenges. What general conclusions can be drawn from the analysis? Perhaps the most significant is that the various approaches discussed used largely unsystematic strategies leading ultimately to alienation. The insistence on the uniqueness of technical writing as a discipline, starting symbolically with the assignment of its name, is clearly contributory to alienation.[25] So is the characteristic methodological overemphasis on distinguishing, as opposed to shared, features. Equally contributory is the methological privileging of binarism, for binarism is inherently an agonistic notion, a one-on-one opposition, e.g., technical writing versus non-technical writing. The contribution of the epistemological privileging of scientific positivism to an ideology of alienation has already been discussed by such critics as Habermas and Marcuse.[26]

The alienation under discussion is manifested in several ways. On one level, it takes the form of classic dissociations from parent disciplines. Witness the dissociation of technical writing from composition implied by W. Earl Britton: "When I try to teach tech writing to students who have had the conventional first year course, I run smack into all the characteristics that I have labelled as wrong about the course."[27] Fred H. MacIntosh dissociates technical writing from literature:

> Probably the fundamental step toward preparing to teach [technical writing] courses is a basic change of attitude, a willingness to cut the umbilical tether back to the purely literary studies of most graduate English programs, and instead walk down main street with open minds, to hear the world's ideas of its language needs, not the ideas of the English departments....[28]

Dwight W. Stevenson dissociates technical writing from both composition and literature when he seeks to clarify "just how instruction in technical writing differs from conventional writing instruction of the sort one finds in freshman composition and in literature courses."[29] Stevenson is joined by J. C. Mathes and Peter R. Klaver in a dissociation of technical writing from composition, literature and traditional rhetoric:

> The principles taught in English composition derive from classical rhetoric, from the literary tradition, and from such humanistic educational objectives as self-awareness. Although the experienced technical writing teacher judiciously applies these principles to technical writing, he or she often finds principles derived from these sources to be quite inappropriate.[30]

The dissociation of technical writing at the disciplinary level has several correlatives. For instance, Marxist critic Stanley Aronowitz laments the "demoralization of teachers and their alienation from work" which results when their work, composition teaching, is separated from their training.

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literary studies.[31] Technical-writing teachers, cut off from composition as well as literature, would then presumably be seen as doubly alienated from the humanistic disciplines in which they were largely trained. Turning from the teacher to the student, we learn of an alienation originating in the dissociation of technical writing from traditional rhetoric. If traditional rhetoric views writing as a broadly humanistic discipline, then technical writing with its legacy of scientific positivism becomes a set of specialized skills practiced by a trained elite. Inculcation of this view in students may be seen, ultimately, as alienating them from a society lacking such skills.[32] Such alienation of technical professionals is, of course, yet another manifestion of that alienation known as the "two-cultures" syndrome.

SUGGESTIONS

Given our general conclusion that present definitions of technical writing are non-viable, largely unsystematic and ultimately rooted in as well as contributory to an ideology of alienation, let us return to the original question: What is technical writing? Though our purpose here is not to offer yet another definition, we can indicate--based on our analysis of previous definitions and the state of the discipline--the nature of the issues which must be addressed in the quest for a viable definition. In broadest terms, we see the need for a more theoretically based, contextual definition of technical writing. Such a definition would avoid an a priori privileging of technical writing, and would evolve from creative and systematic attempts to see technical writing in relation to other forms of discourse and modes of representation. Only within such a comparative perspective can one meaningfully pose the question of the distinctiveness of technical writing. The proposed approach would transcend the one-on-one, i.e., discipline-by-discipline or feature-by-feature, approaches characteristic of previous attempts at definition. This approach would also lead to a more balanced treatment of shared and distinguishing features of technical writing. Technical writing would be viewed, not as a set of unique specialized skills practiced by a professional elite, but as one of a series of discursive possibilities for perceiving and organizing reality. Ultimately, in the broad perspective proposed, technical writing would be seen, not as an hypostasized autonomous entity alienated from the community of discourses to which it rightfully belongs, but as an interdiscursive nexus of features.

What kind of inquiry do we see as an appropriate preliminary to the post-positivistic definition of technical writing needed? Or, to take on a more manageable task here, what lines of inquiry may be congenial and fruitful for individuals trained in the humanistic disciplines, most particularly in literature? Let us begin with the observation that, from a post-positivistic viewpoint, all discourse--including technical writing-- can be regarded as symbolic reconstructions of reality based on modes of intelligibility used to understand experience. Narration, one mode of intelligibility, was long regarded as the special province of literature; but theorist Jonathan Culler attests to its wider utility:

W. B. Gallie has argued in _Philosophy and Historical Understanding_ that the kind of understanding afforded by history writing involves not grasping causal laws but rather seeing how one thing leads to another as in a story. In other areas as well, it can be shown that the notion of understanding can be explained in terms of following a story, perceiving a narrative pattern. Thus the question of what is a story or what are the basic patterns of narrative becomes the focus of a new and important inquiry, to which literary critics [or ex-literary critics], with their interest in plot, can make important contributions.[33]

How does a technical-writing instructor embark on this line of inquiry? Familiarity with the work of literary narratologists such as Tzvetan Todorov, Northrup Frye, and Gérard Genette provides an obvious starting point.[34] As does the work applying narrative models in history by Hayden White, in sociology by Robert Nisbet, and in anthropology by Claude Lévi-Strauss.[35] Most importantly for our purpose here, analysis of technical texts in narrative terms is needed. Gerald Holton's description of "the technical report...of the analysis of a bubble-chamber photograph" warrants reproduction in full:

> ...[The technical report] is cast largely in terms of a life-cycle story. It is a story of evolution and devolution, of birth, adventures, and death. Particles enter on the scene, encounter others, and produce a first generation of particles that subsequently decay, giving rise to a second and perhaps a third generation. They are characterized by relatively short or relatively long lives, by membership in families or species.[36]

Though Holton's treatment of technical texts is too impressionistic to serve directly as a model for the kind of discourse analysis needed, it does provide a suggestive first step in looking at technical texts not as truth but as act of narration. Ultimately, however, all such characteristically parochial one-on-one, discipline-by-discipline treatments must give way to a comparative treatment of narrative crossing traditional disciplinary boundaries.

But such comparative analysis may be undertaken on less ambitious levels as well. Consider _one_ element of narration—description, for instance. Even a cursory glance at technical-writing textbooks exposes a striking uniformity in the treatment of description; such treatments are largely monolithic, mechanistic, and reductionistic in their failure to acknowledge the implications of such fundamental issues as context. (No doubt the typical recipe proposed for description has its roots in scientific positivism. But that is another story.) In any event, such prescriptive oversimplification seems unwarranted in the light of the rich tradition of literary description and the slowly emerging theory of description.[37] Once again, we need a cross-disciplinary, comparative study of shared discursive elements—in this case, of description. And once again, the literary background of the technical writing teacher is a valuable asset.

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But our list of potentially profitable topics of inquiry can easily be extended. Holton's work on "themata" in technical discourse suggests the applicability of the literary notion of theme as a fundamental unit in the production of meaning underlying all discourse.[38] Rhetorical theory suggests other possible topics for fruitful studies. For example, rhetorical figures provide models that are applicable to a variety of discourses, including technical writing.[39] In the quest for a contextual definition of technical writing, there is much to be done.

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1. For an example of the systematic use of a definition of technical writing as a basis for generating courses and curricula, see Dwight W. Stevenson, "Mapping the Unexplored Area: Developing New Courses and Coherent Programs in Technical Communication," Journal of Technical Writing and Communication, vol.8, no.3, 1978, pp.193-206. Defining technical writing in terms of audience and purpose, Stevenson sets up a matrix "to identify needed technical writing courses and to define coherent sets of courses." (p.193)

2. For a discussion of the importance attached to identifying distinguishing features during the emergence of a discipline, see Thomas S. Kuhn, The Structure of Scientific Revolutions, 2nd ed. (Chicago: University of Chicago Press,1970), especially ch. II.

3. For a statement of the autonomous disciplinary status of technical writing, see "Writing is for Other People," The Technical Writing Teacher, vol.6, no.2, 1979, p.38. The author, James W. Souther, notes that technical writing "is a discipline, just as is creative writing and is journalistic writing". The quotation recognizing the maturity of the discipline is from Thomas E. Pearsall, "Beyond the Basic Course: Building a Program in Technical Communication," English in Texas, vol.11, no.4, Summer 1980, p.93.

4. "On Expanding the Definition of Technical Writing," Journal of Technical Writing and Communication, vol.8, no.2, 1978, p.136. We adopt the common term "technical writing" throughout this paper as a simple convenience.

5. Gordon H. Mills and John A. Walter, Technical Writing, 4th ed. (New York: Holt, Rinehart, and Winston, 1978), p.3.

6. "On Expanding the Definition."

7. "A Humanistic Rationale for Technical Writing," College English, vol.40, no.6, Feb. 1979, p.617.

8. "On Expanding the Definition," pp.133-34.

9. "A Humanistic Rationale," p.613.

10. "A Humanistic Rationale."

11. "On Expanding the Definition," p.136.

12. For discussions of post-positivistic views of science, see especially Barry Brummett, "Some Implications of 'Process' or 'Intersubjectivity': Postmodern Rhetoric," Philosophy and Rhetoric, vol. 9, no. 1, Winter 1976, pp.21-51; Michael A. Overington, "The Scientific Community as Audience: Toward a Rhetorical Analysis of Science," Philosophy and Rhetoric, vol. 10, no. 3, Summer 1977, pp.143-64.

13. Patrick M. Kelley and Roger E. Masse, "A Definition of Technical Writing," The Technical Writing Teacher, vol.IV, no.3, Spring 1977, pp.94-97.

14. W. Earl Britton, "What is Technical Writing? A Redefinition," The Teaching of Technical Writing, eds. D.H. Cunningham and H.A. Estrin (Urbana: National Council of Teachers of English, 1975), pp.9-14.

15. Thomas E. Pearsall, Teaching Technical Writing: Methods for College English Teachers (Washington, D.C.: Society for Technical Communication, 1975), p.1.

16. For an implicit attack on monism and a testimony to the diversity of technical writing, see "Mapping the Unexplored Area," p.194: "'[T]echnical writing,' as it is almost always called, is not in fact a single course. Rather, it is a whole variety of courses...."

17. Attributed to R. Jakobson and M. Halle by Jonathan Culler in Structuralist Poetics: Structuralism, Linguistics and the Study of Literature (Ithaca, N.Y.: Cornell University Press, 1975), p.15.

18. Structuralist Poetics, pp.15-16.

19. John S. Harris, "Metaphor in Technical Writing," The Technical Writing Teacher, vol.II, no.2, Winter 1975, p.9.

20. See, for example, Edmund P. Dandridge, Jr., "Notes Toward a Definition of Technical Writing," The Teaching of Technical Writing, pp.15-20. He offers statistical evidence that "good technical writing is, on the whole, stylistically simpler than good nontechnical writing."(p.15)

21. "Notes from the Besieged, or Why English Teachers Should Teach Technical Writing," College English, vol.41, no.8, April 1980, p.882.

22. "Notes from the Besieged," p.882.

23. Hull defines technical writing "as prose constructed to convey ideas and facts with maximum clarity and authority." "Notes from the Besieged," p. 882. Hull asserts that "clarity and authority" imply

"technical writing 1) is carefully tailored to match task and audience, 2) has a clear purpose, 3) is systematically, logically, and purposefully organized, 4) explains clearly and as fully as necessary, 5) usually deals with verifiable facts, 6) usually supports generalizations with facts, 7) logically matches facts and generalities, 8) is economical in content, organization, and style, 9) is mechanically correct, and 10) possesses the dignity of truth and restraint." (p.882) Supporting his definition, Hull notes that his students "indicate considerable satisfaction with the usefulness of such a concept." (p.883) Excepting the emphasis on "verifiable facts," which can be challenged readily on epistemological grounds, one may ask whether Hull has not in effect simply relabeled a conventional composition course.

24. "On Expanding the Definition," p.135.

25. See, for example, James W. Souther, "What's New in Technical Writing," English in Texas, vol.11, no. 4, Summer 1980, p. 79: "Technical writing, like fiction or journalism, is a separate discipline, a unique kind of writing."

26. Jürgen Habermas, "Technology and Science as 'Ideology'," Toward A Rational Society: Student Protest, Science, and Politics (Boston: Beacon Press, 1970), pp.81-122; Herbert Marcuse, The One-Dimensional Man (Boston: Beacon Press, 1964).

27. "The Trouble with Technical Writing is Freshman Composition," The Teaching of Technical Writing, p.73.

28. "Teaching Writing for the World's Work," The Teaching of Technical Writing, p.27.

29. "Mapping the Unexplored Area," p.204.

30. "Technical Writing: The Engineering Educator's Responsibility," Engineering Education, Jan. 1979, p.332.

31. Stanley Aronowitz, "Mass Culture and the Eclipse of Reason: The Implications for Pedagogy," College English, vol.38, no.8, April 1977, p.772.

32. S. Michael Halloran, "Eloquence in a Technological Society," Central States Speech Journal, vol.29, Winter 1978, pp.221-27, especially p.224.

33. Jonathan Culler, "Literary Theory in the Graduate Program," The Pursuit of Signs: Semiotics, Literature, Deconstruction (Ithaca, N.Y.: Cornell University Press, 1981), pp.214-15.

34. See especially Tzvetan Todorov, "Les transformations narratives," Poétique de la prose (Paris: Seuil, 1971); Northrup Frye, Anatomy of Criticism (New York: Atheneum, 1966); Gérard Genette, Narrative Discourse: An Essay in Method, trans. J. E. Lewin (Ithaca, N.Y.: Cornell University

Press, 1980).

35. See especially Hayden White, _Metahistory: The Historical Imagination in Nineteenth-Century Europe_ (Baltimore: Johns Hopkins University Press, 1973) and _Tropics of Discourse: Essays in Cultural Criticism_ (Baltimore: Johns Hopkins University Press, 1978); Robert Nisbet, _Sociology as an Art Form_ (London: Oxford University Press, 1976); Claude Lévi-Strauss, "L'analyse morphologique de contes russes," _International Journal of Slavic Linguistics and Poetics_, vol.3, 1960, pp.122-49 and _La Pensée sauvage_ (Paris: Plon, 1962).

36. Gerald Holton, _The Scientific Imagination: Case Studies_ (Cambridge: Cambridge University Press, 1978), p.17. For further analysis, see his _Thematic Origins of Scientific Thought: Kepler to Einstein_ (Cambridge, Mass.: Harvard University Press, 1973), pp.107-9.

37. See, for example, Philippe Hamon, "Qu'est-ce qu'une description?" _Littérature_, vol.6, 1972, pp.475-82; C. Linde and W. Labov, "Spatial Networks as a Site for the Study of Language and Thought," _Language_, vol.51, 1975, pp.924-39.

38. See _The Scientific Imagination_, pp.3-24 and _Thematic Origins of Scientific Thought_, pp.11-68 and pp.91-114, _passim_.

39. Roman Jakobson's analysis of metonomy and metaphor as tropological figures underlying both two types of aphasia and the structure of discourse is perhaps the best known example. See "Two Aspects of Language and Two Types of Aphasic Disturbances," _Fundamentals of Language_ (The Hague: Mouton, 1956). For an application of Jakobson's distinction to the twentieth-century English novel, see David Lodge, _The Modes of Modern Writing_ (Ithaca, N.Y.: Cornell University Press, 1977). For an application of Kenneth Burke's four master tropes—metaphor, metonomy, synecdoche, and irony—to historical discourse, see _Metahistory_. For an application of irony and metaphor to sociological texts, see Richard H. Brown, _A Poetic for Sociology_ (Cambridge: Cambridge University Press, 1977). Once again, though, we note the need to go beyond such studies in search of an interdiscursive perspective.

Technical Writing in America: A Historical Perspective
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The standard distinction between poetic and referential language is in part responsible for the gulf between science and the humanities, and it may also account for the distress many teachers of English feel when faced for the first time with the prospect of teaching technical writing (ref. 1). To the humanistically educated critic-scholar, the utilitarian prose of science and technology seems to defy description and analysis, so that technical writing is often approached in terms of what it is not, with emphasis on the features of "normal" rhetoric it eschews. The technical writer's goal, Joseph Priestley reminds us as early as 1761, is to "let every word stand in such a place and connection, as that its meaning shall be in no danger of being mistaken," a caveat echoed in the introduction of many of our technical writing textbooks, but which seems to divorce technical communication from other forms of linguistic experience by making language limiting and reductive rather than creative and expansive (ref. 2).

I believe that the emphasis on technical/scientific writing as radically different had blinded us to those traits it has in common with all species of composition and has caused us to neglect research on fundamental rhetorical issues. Our teaching, too, should be informed by a thorough knowledge of rhetorical theory, even if this is never communicated directly to students. A complete theory of technical discourse would include information about the attitudes and motives of writers, the situations which motivate (or coerce) them to write, the definitive features of technical style and form, the inter-relationship of expression and creativity, and the functions of communication in shaping and preserving scientific networks and institutions.

These areas should be explored with respect to contemporary practice, and many researchers are presently so doing. I believe, however, that there is much to be gained by viewing them within a historical perspective. Some potential benefits of such a study, beyond those usually ascribed to histori-cal research, include the following:

1. It would show long-term trends in technical writing and enable us to choose intelligently from the available developmental paradigms (continuum, cycle, evolution, etc.), to delineate stages, if any, in the genre's develop-ment, and to determine the relationship between scientific progress and the communication of it.

2. The written historical record concerning such subjects as the exigencies which give rise to scientific discourse or the author's attitudes

towards rhetoric may be more revealing than the stated beliefs of modern practitioners working within well-established conventions.

3. Finally, and most important, the struggle of early scientists and engineers to create viable forms of communication, to adapt and disseminate information to varied audiences, and to build acceptable channels of communication is a potentially enlightening, heretofore unexamined aspect of the history of science and technology.

This study is best carried out by teachers of rhetoric, literature, and technical writing. With well-developed critical faculties, a commitment to historical accuracy, and an orientation towards the values underlying human endeavors rather than towards the recounting--or simply counting--of the results of those endeavors, the humanities scholar is in a unique position to understand the broad implications of the history of technical writing. Specialists in the history and philosophy of science have concentrated almost exclusively on the content of scientific communication and have ignored the history of rhetoric. Brooke Hindle's ground-breaking study of the American Philosophical Society (APS), for example, ignores a large body of evidence concerning the Society's debates over the nature of scientific writing, carried on during the last decades of the eighteenth century as it initiated its Transactions, which as the first substantial scientific periodical constitutes the Society's most enduring contribution to American science (ref. 3). Those colleagues in our own departments who are at all interested in science deal only with its impact on literature. For the most part, the existing historical studies of technical writing are the unsystematic appraisals of non-scholars, hastily researched and sometimes inaccurate papers and articles scattered in out-of-the way journals and proceedings, or well intentioned but analytically unprofitable discussions of the "hidden poetry of science."

Recently I have been systematically reappraising the roots of American scientific writing; I have focused on scientific and medical societies and their publications, both because the paper and report remain the standard forms of scientific discourse and because these organizations, notably the APS, possess extensive archives and libraries of early scientific activity. I am not yet prepared to provide even in the broadest outline an overview of American scientific writing up to the present. I will, rather, describe its practice in the earliest phase, from the seventeenth century until approximately 1815, at which point specializations begin to coalesce around professional organizations and specialized journals. In doing so, I will seek to answer some of the questions posed earlier about writers, texts, and readers.

In its initial, immature phase, American science saw its essential tasks to be observation and data compilation rather than theory formulation. This situation results from the scarcity of practitioners conversant with scientific theory and the overriding influence of Francis Bacon, whose system insisted upon these as the most fruitful scientific activities, and in part from the colonial mentality in general and a two-tiered international system of "absentee landlordship in science" in which Europeans alone were granted license to interpret data gathered from peripheral sites (ref. 4). Like their

counterparts in England, seventeenth-century Americans presented their obser-
vations in the unadorned, nominal style of the Royal Society, with figurative
language employed only to translate unfamiliar phenomena into familiar terms,
a heavily Latinate vocabulary, and a very limited technical lexicon. Samuel
Danforth of Cambridge, Massachusetts, who has as good a claim as anyone to
the title of first American scientist, is typical in these respects. His
Astronomical Description of the Late Comet (1665) is syntactically straight-
forward, with very short sentences even by modern standards; ponderously
learned ("This Comet is no lunary Meteor or sulphureous Exhalation, but a
Celestial Luminary."); and simplistically metaphorical ("A Comet is denomi-
nated from its Coma or Bushy lock, for the Stream hath some resemblance of
hair."). Since the colonial audience for such words was severely limited--
amateur enthusiasts, scattered University faculty, and the clergy--the usual
outlets were British publications such as the Philosophical Transactions of
the Royal Society, Medical Observations and Inquiries (1757-84), and Medical
Essays and Observations (1733-42), which despite their titles accepted com-
munications on all scientific topics.

   Along with the clergy, physicians constituted the largest class of
scientifically literate persons in the colonies, though apparently less than
one in ten had the benefits of formal education (ref. 5). A medical disaster,
the outbreak of the "throat distemper" in New England during the 1730's,
provided the impetus for the first extensive medical publication in America.
The letters, pamphlets, and newspaper articles published at this time show the
range of styles writers adopted and their awareness of different audiences.
Descriptions of symptoms by a clergyman and two physicians indicate very dif-
ferent responses to the problem of style:

   Rev. Jonathan Dickinson: "I take this Disease to be naturally an
Eruptive milliary Fever. And when it appears as such, it usually begins with
a Shivering, a Chill, or with Stretching, or Yawning; which is quickly
succeeded with a sore Throat, a Tumefaction of the Tonsils, Uvula, and Epi-
glottis, and sometimes of the Jaws, and even of the whole Throat and Neck.
The Fever is often acute, the Pulse quick and high, and the Countenance
florid."

   Anonymous (probably Dr. John Morgan): "During these appearances, the
throat seem'd, as it were, full and swell'd and the patient seldom failed to
complain of great soreness, had an evident hoarseness and sometimes a cough.
The pulse was generally full and quick, yet attended with some remissions and
even sinkings."

   Dr. William Douglass: "[T]he reliquiae were thrown off by Urtications,
by Vesications in several parts of the Body, by serpiginous eruptions chiefly
in the face, by purulent Pustules, by Boils, by swellings and impostumations
in the groin, armpits and other parts of the body" (ref. 6).

   The first two passages address a lay audience and thus communicate in
relatively familiar terms. The style of the clergyman and the physician are
essentially indistinguishable, though Dickinson uses a slightly more technical
vocabulary. Elsewhere in their articles, both suggest a humane concern for

the patient, Dickinson referring at several points to the struggle of "the poor miserable Creature." Their sense of stylistic decorum also permits literary allusions and stylistic ornaments to play minor roles: Dickinson characterizes the disease as a mortal enemy, and Morgan depicts the struggle in dramatic and military images and underscores his opposition to bloodletting with an allusion to Dryden.

Douglass's description more closely resembles the jargon-laden prose for which physicians have become notorious, especially when addressing other "Gentlemen of the profession" (p. ii). Even to his colleagues, however, his elaborate phrasing is excessive: Dr. Samuel Bard, a professor of medicine at Columbia, though quoting him approvingly for his "accurate and judicious" observations, finds them needlessly obscured by his "singularity of style" (ref. 7). In fact, Douglass's high-sounding vocabulary describes such commonplace phenomena as blisters, (vesications), a spreading rash (serpiginous eruptions), and abcesses (impostumations).

In the twentieth century, the motives for producing a given piece of technical writing are conventional, clearcut, and objective: the advancement of knowledge, generation of a specific output or product, or meeting a pre-determined goal. In the early years of scientific activity, motives are more diverse and tend to be stated directly. They include patriotism and the desire to create the bonds within a field of inquiry which will lead to its professionalization.

Most of the latter motives can be inferred from the writings under con-sideration. The most apparent are the desire to be useful, to promote profes-sional standards, and to stimulate scientific activity in others. All three writers insist that their writing promotes the general welfare by sharing their specialized knowledge with the public. All also point with satisfaction to their professional concern for detailed observation; Morgan is exemplary: "As the State of Physic now stands, the Faculty having been amused with dif-ferent Theories for many ages have concluded, that reasoning from observation and facts. . . is the only basis on which we can rest with safety" (p. 164). This Baconian emphasis is the single trait most common in all early American science and the most obvious method of distinguishing cognoscenti from amateurs. In subsequent years, a significant proportion of the papers the APS rejects are cited for their failure to observe and describe with scientific thoroughness and accuracy. Douglass is concerned not only with standards of observation (his labored vocabulary no doubt to his mind contri-butes to this objective), but also with using publication to establish a net-work of researchers cooperating on a common problem. Douglass is also careful to underline his objectivity by dissociating himself from those who publish their findings solely as a "Quack bill to procure Patients" (p. ii). Half a century later, the hope of eliciting professional cooperation motivates the editors of the Medical Repository, the first successful American medical journal, who see a "medical collection" of "an extensive mass of experiment [and] a various and judicious selection of facts" as the surest way to progress (ref. 8).

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The need of early scientific writers to establish credibility neces-
sitated a personal tone far removed from modern conventions of objectivity.
Just as seventeenth-century correspondents to the Royal Society were careful
to include code words like "ingenious and industrious" or "curious and
inquisitive" gentlemen in identifying themselves and their informants,
American writers in the eighteenth century always account for their sources'
reliability and, if at all possible, observe phenomena with their own eyes.
An excellent instance of this trait occurs in another of Dr. Morgan's
papers, an account of "A Living Snake in a Living Horse's Eye" in the APS
Transactions. Morgan devotes two pages to discussion of "miraculous
appearances," his own opposition to "visionary speculatists," his hypothesis
that the creature in question is a "filimentary production" animated by a
"convulsion in the nerves," and, finally, his assurance after "the closest
ocular examination" that the "snake"(actually a parasitic worm) is
genuine (ref. 9).

One result of this need to establish personal credibility is a more
argumentative tone in much of the writing than modern conventions would per-
mit. Douglass, for example, refers scornfully to the "rash inconsiderate
opinion[s]" and "mischievous Practice[s]" of other physicians treating the
throat disorder (pp. 2-3). In this combative atmosphere, it was normal for
such arguments to be quite protracted. Manuscripts in the APS archives
indicate that the inventor Oliver Evans continued to inveigh in print against
Benjamin Latrobe for criticizing his steam engine eleven years after the
fact, even though that criticism was a single paragraph (which Evans never
saw) in a draft report which Latrobe excised prior to its publication
(ref. 10).

The most successful effort to impose order and standards upon scientific
writing was the publication of the APS Transactions, a collection modeled
closely upon the Philosophical Transactions of its parent organization, the
Royal Society. The publication's history is too complex and its quality is
too uneven to recount in detail here; during its initial stage of develop-
ment, six volumes appeared at irregular intervals from 1769 to 1809. Its
primary accomplishments are several: it imposed minimal standards for form,
methodology, and style, though the latter were applied unevenly; it insti-
tuted an increasingly successful referee system to consider papers; although
it usually published papers as received, it also printed the first edited
and collaborative papers to appear in this country; and, most important, by
distributing scientific writing far more widely than previously possible,
it encouraged imitators and provided a model for potential contributors.

The most consistent standard observed in APS publications is objectivity.
The Society clearly specifies in its first Transactions tha its members will
not "give their Opinion, as a Body, upon any subject, either of Nature or
Art, that comes before them" (p. iv). Occasionally this rule resulted in
minimal editing, as in a paper by John De Normandie concerning "The Thera-
peutic Value of the Waters of Bristol, Pennsylvania," a republication of two
earlier articles (both 6 October 1768) in the Pennsylvania Journal and
Pennsylvania Gazette (ref. 11). Two paragraphs are removed, perhaps because
they have too much the tone of an advertisement, with references to the

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Bristol springs' "more remarkable tonick powers than common springs" and "a suitable and convenient house and bathing place" under construction. Except in extreme cases, the Society's official neutrality had little impact on the form or substance of its publications; certainly, it caused the removal of very few hypotheses because they were unacceptable. Only once during this period did the Society approach breaching its operating principle by showing favoritism to one of its own members. This occurred in 1806, when an editorial committee rejected a paper on the origin of icebergs by Samuel L. Mitchell and within weeks accepted a similar one by Anthony Fothergill, who was not only a member of the society but also of the committee. Moreover, Fothergill's paper is in many ways inferior: it contains undesirable rhetorical flourishes, is based upon less precise observations, and contains a contradictory hypothesis, that icebergs are "gradually formed stratum super stratum. . . attache[d] . . . to the bottom" of the ocean, even though they are "specifically lighter than water." The committee raises the issue of the propriety of its action in its report, and the society as a whole eventually found an excuse not to publish Fothergill's paper (ref. 12). However, nowhere else in the records of this period is there evidence which so obviously calls into question the Society's neutrality.

For the most part, the Society's principle of selection is, as stated in the first volume, "the importance or singularity of the subjects, or the advantageous manner of treating them" (p. iii). The latter phrase refers to the scientific rather than stylistic manner: the use of close observation, experiments, or statistical methods rather than careful writing. Nevertheless, the record indicates that style and form were considerations in some cases. The best example is the work of Benjamin Shultz, an amateur naturalist whose work is best left cloaked in anonymity. Over a ten-year period (1797-1807), Shultz persistently submitted rather lengthy papers on noxious plants, essential oils, animal temperaments, and light. All were rejected, though Shultz sought the patronage of Thomas Jefferson and (more successfully), Dr. Benjamin Rush. Editorial comments are almost entirely negative ("extremely inaccurately written," "diffuse and irregular"), and the works themselves are models of prolixity, opacity, and confusion. His first paper, on noxious plants, is typical: the first section, eight of its thirty pages, is a rambling attempt at a review of the literature, which alludes vaguely to many theories but cites no sources; the discussion itself (sixteen pages) is poorly organized (one-quarter is excursive footnotes and nearly one-half is simply lists of Linnean nomenclature) and riddled with semi-literature metaphorical descriptions ("innocent plants," "naked. . . destitute of wir_ed, downy, or hairy Substances." "Calyx. . . cherishing the Seeds in its bosom"); and a "Review" takes up the final six pages, again with nearly one-third of its text extraneous comments in footnotes (ref. 13). Shultz's papers are valuable only in that they indicate that minimal stylistic standards for scientific writing existed at the end of the eighteenth century, although they were never clearly articulated.

The usual form of submission was the personal letter or memoir enclosed in a letter, although more formal presentations with textual subdivisions and elaborate figures appeared even early on, including at least one "formal report" (Samuel Felsted's "Plan and Description of a Horizontal Wheel,"

6 July 1798), a fair manuscript copy, bound in boards, with three well-drafted, pull-out figures. All of the papers submitted at this time are the work of individuals, but a number of published articles are collaborations and amalgamations. The most complex example of such an article is William Mugford's "An Account and Description of a Temporary Rudder," which derives from at least four sources: Mugford's original letter and description of the rudder; a newspaper account of its invention; a draft report combining the preceding items and commenting upon them; and an explanation of an illustration, apparently requested from Anthony Fothergill. The published article differs from all four sources in both substantive and stylistic details (including reinstatement of cancelled material from the draft), indicating that yet another writer or editor had a hand in it (ref. 14). The Society did not generally have the editorial resources to rework submissions so elaborately; however, upon occasion a specialist was asked to rewrite or expand promising observations. The naturalist Benjamin S. Barton performed such duties on an anonymous "Observations on the Phalaeena Tinea" (a parasitic moth which inhabits beehives). He expanded a six-page document to forty-four, in the process transforming a chronological memoir into a topically arranged report which incorporated Linnean descriptions, a review of the literature, and his own and other observations from various sources (ref. 15).

One of the APS's most important innovations was introducing committees of specialists to determine which papers were suitable for publication. The Society's minutes do not record when such review committees were first established or exactly why. Certainly, no explicit order was given. From its creation, however, the APS used ad hoc committees for such purposes as granting prizes, examining inventions, translating foreign correspondence, and seeing the first Transactions through the press. After the second volume appeared in 1786, references to such committees begin to appear in the minutes, the first on 21 December 1787; however, they are appointed, do their work, and report sporadically and haphazardly. Thirty-five such reports are extant from the period 1787-99, eighty-six from 1800-09, and twenty-three from 1810-15. These reports cover fewer than half of the papers received, and many were lost or delayed. On 27 December 1798, for example, the secretary reported on sixty-two papers received during 1797-98; two-thirds (thirty-nine) were listed as "referred," but only twenty committee actually filed reports. The archives also show embarrassing delays: Shultz's paper on noxious plants was in committee for over a year; Barton's paper on "Poisonous Honey" was read on 18 July 1794, never reported upon, and finally published only in Volume V (1802). The worst fate is Robert Patterson's, whose "An Improvement in the Common Ship-Pump" was read on 17 July 1795 but "afterwards mislaid"; it emerges in print twenty-three years later in Volume I of the new series (1818). Such delays harmed the journal's prestige and credibility, and competing periodicals were able to publish backlogged papers (four such instances were noted in the minutes in November 1812). The society's most prestigious member, Joseph Priestley, complains in 1798 that he must send "Articles. . . of considerable importance" elsewhere because the Transactions does "not answer the primary purpose of such publication, which is speedy communication of philosophical discoveries" (ref. 16).

By the opening years of the nineteenth century, the sporadic, compendious, uneven <u>Transactions</u> had served its purpose. It had launched American scientific publication, provided some minimal standards for both form and content, and had demonstrated a potentially workable system of manuscript selection. Most important, it had shown that American scientists could work cooperatively and objectively to disseminate the results of their research. The next stage of development, the publication of specialized journals like the <u>American Mineralogical Journal</u> (1810), could not have occurred, nor could such journals have taken on so modern an appearance, without the pioneering work of the APS. Thus, the first generation of scientists in the new republic made substantial progress and paved the way for the professionalization and specialization of scientific communication. Their work, with all its shortcomings and peculiarities, is recognizably the ancestor of modern technical writing; continued study of the historical record will show not only how modern conventions of writing emerged, but also how they were shaped by the socio-cultural forces, creative energies, and personal values common to all scientific, indeed, all human, endeavors.

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TECHNICAL COMMUNICATION: NOTES TOWARD DEFINING A DISCIPLINE

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Perhaps this is simply an era when simplistic solutions to complex problems becomes a dominant theme for our age. It has somehow become fashionable to make very general statements and present them as universal truths. In the field of technical communication, for instance, one can survey the definitions posited in virtually any major text and discover that each one violates every major rule of definitions. The most popular method for defining the field is to state that technical writing is any writing that supports technology or technological activities. One then is left with a hollow feeling that he/she needs a nice yardstick for measuring what "technology" is. One is also left with a nagging, perhaps niggling, doubt that there is something subversive, perhaps even anti-humanistic about "supporting technology." It seems to me that we have to stretch this definition in some ways and collapse it n others; I don't, however, want to put this effort on a Procrustean rack. I want to suggest, first, some ways in which the field can be defined in a tightly structured empirical way and, second, to posit the implications of technical communication for a humanistic education in a technological age.

Unlike any other field, with the possible exception of science writing, technical writing, strongly implies that there is a clear emphasis on the product. In this sense it is at one with the field it claims to support. We find that even in the works of such people as Herbert Simon, the key feature of technological activities is the production of artifacts. It is this informing principle of technology that, I believe, tends to obscure the definition of technical writing in all of its possible permutations. Editors in the corporate environment express their concern only about the lack of documentation for a new product; that concern is not tempered with a concomitant regard for the veracity or usefulness of the document (nor for that matter, is there any interest in the ethical dimensions of the document).

This drive for product has another deletericus effect on technical writing: it creates a focus on words as a variety of transparent symbols that work best when they don't get in the way of the user. James Kinneavy, for instance, proposes this view of referential language in support of technological activities. What is clearly (no pun intended) wrong with this perspective is that words become less than words. Their task is to slip through the reading process with the least amount of effort and to elicit as little attention as possible. Unfortunately, we know from such theorists as Michael Polanyi, Gerald Holton, Thomas Kuhn, and Larry Laudan that language and technological thought (activity) simply don't work that way. There is no such animal in the entire world as an unambiguous text (or illustration for that matter). All reading, as Iser, Rosenblatt, Bleich,

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and others have argued, is an interactive process informed by the readers
interests and background. This counter argument is interesting for a variety
of reasons. First, it refutes the reasoning that says that language is
transparent. Readers do have to participate in the text; referential
texts are less open to interpretation and ambiguity than a piece of fiction,
but they are still open. Second, this observation supports the more
realistic view of the communication process and communication models in
technical writing. Until we accept the fact that there is a reader who has
expectations, needs, and failings (perceptual as well as social), the
supposed objective nature of technical texts will remain useless and
mythical. Writing and its uses in the real world simply do not support this
naive view of writing as artifact, as product.

Another view of this same perspective is the position that sees
writing as a pure object that exists in some kind of vacuum. The reader is
simply not part of the schema of communication. Of course, some of this
thinking is informed by the general perception that much which is technical
is, in fact, visual in nature. Admittedly that is a valid point when we
consider that virtually every study of technical and scientific material in-
dicates that such texts are approximately thirty percent visual. Many
companies, particularly international corporations, have even increased
that percentage in an attempt to deal with transcultural problems. However,
it is hard to escape the needs of a literate and demanding readership.

This situation is also supported, consciously or unconsciously, by the
academic and professional societies. The International Technical Com-
munication Conference (ITCC), for example, has offered only a handful of
papers on reading, as distinct from readability in over a quarter century
of meetings. Most of their offerings have, indeed, focused on sophisticated
mechanical crutches that analyze written material in a quantitative fashion.
As Merrill Whitburn and S. M. Halloran have pointed out, none of this
thinking has done anything constructive to assist ours or the writers'
understanding of audience. Instead it has pointed out, and perhaps
exacerbated, the tensions that exist in defining who technical writers are
and what they are about. ITCC is not the only culprit. The International
Reading Association has not even given lip service to audience. In fact,
only three papers on college or adult audience reading perception were
offered at their 1979 convention. One of those papers was by Anne Eisenberg
who has indeed moved into untested territory by exploring the demands of
reading scientific and technical material.

What does this lack of interest in the reader say for defining the
field of technical communication, and what are the consequences of this
information? Succinctly, ignoring the reader violates everything we know
about communication and communication models. Even if we use the most
common model--Shannon/Weaver--we have a writer, a medium, and a receiver.
If we are not concerned with who gets the message we compose and send, then
why are we sending it? What are we doing?

One can, of course, try to make the case that technical writing
textbooks, indeed, keep audience in mind. I haven't been able to convince
myself that this is true. For instance, Mathes and Stevenson go to great

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lengths to explore audience levels throughout an organization. What they prove is that you can be aware of those levels, not how to write to them. Walker Gibson, it seems to me, does a better job in both _Persona_ and _Tough, Sweet, and Stuffy_. Admittedly, both or perhaps all of these approaches are still too subjective. Let me take a few moments to explore an empirical methodology that reaches into communicology, contemporary discourse theory, and even ethics, which I feel, tentative though it is at this point, offers a way for defining audiences, purposes, and by extension, the domain of technical communication with a great deal of precision.

My suggested model combines the work of Charles Osgood, Torgerson and the Princeton Group, Shepard and the Bell Laboratories Research Group, Woefel and the GODI Group; Richard Lloyd-Jones' efforts in primary trait characteristics for evaluating written texts; and finally, William Perry and Lawrence Kohlberg's work on ethical dimensioning. Osgood, Torgerson, and Shepard all propose some variation on dimensional scaling techniques. The flexible measurement system offered by multidimensional scales seems particularly appropriate when dealing with stimuli like words, illustrations, or other abstract concepts. Attempts to predict and explain complex socio-psychological phenomena where stimuli often have many intangible dimensions has created a need for such measurement techniques. Technical communication, which deals with a very specific audience (one is tempted to say social group), can benefit from the application of these measures in two ways. First, the measures, operating through a system of paired coordinate judgements, can be used to identify writing and/or professional conceptions that inform the writer's work. That is, through an interviewing technique, which bears striking similarities to Lloyd-Jones' efforts, the researcher can develop a vocabulary of important issues that the writer uses in both his/her writing and which also forms the basis for judgements about audience. These concepts are then paired and the writer is asked to determine the distance between the entire issue spectrum. What emerges is a pictogram, via computational manipulation, that defines the relationship between a variety of issues. For instance, in a pilot project performed by the GODI Group at Rensselaer Polytechnic Institute (RPI), it was discovered that graduate students in technical writing (as well as participants from academia and industry in RPI's summer institutes) exhibited a great deal of tension about their relationship to humanistic and scientific elements in their education or work. That is, they understood the nature of their work but felt uncertain about its role in relation to technology. Since the study has often been replicated, it would appear that technical writers are not certain about their "supporting" role in relation to the ends of technological activity.

.Similar studies can and have been done in the work environment. One such effort looked at writers' perceptions of audience and purpose and created a programmatic model for document preparation in that environment. The study, however, pushed the multi-dimensional scaling concept further than normal. As a corollary to the writer/editor analysis, the research group did a similar analysis of the potential (and in this case clearly defined) users of the document. Even before the work was produced, before anyone put word to paper, it was obvious that there was a lack of fit between writers' perception of audience and audience expectations. That clearly

defined gap in preliminary assessment became the basis for changes in text production. It also became the basis for a new editorial policy. The final part of this particular study involved follow-up observations of both populations, as well as a control group, to establish goodness of fit. The effort proved to be a phenomenal success.

Of course, this study was exhaustive and demanding on the part of the writing group. Not every company has such luxury. In defense of the expenditure of time and energy, it should be noted that subsequent studies of similar situations became much easier to accomplish (and just as productive). Once this kind of semantic mapping is established, then it can be applied in a variety of situations to determine the optimal strategies necessary to alter a particular set of relationships to achieve communica- tion fit. This has been, admittedly, a very sketchy profile of a very complex system. Briefly summarized, the technique calls for interviews of both writer and audience to develop the concepts necessary for establishing a model of communication fit--audience perception in comparison to audience expectations, writers' methodologies in comparison to readers' habits. The output needs to approximate the   reader's capabilities. This method offers an intriguing model for coming closer to achieving such a purpose than simple platitudes about knowing your aidience; and it does so in a way that closely resembles the Lloyd-Jones model, a model that is generally considered extremely effective for assessing written material.

In addition, this dimensional technique admits of comparison with the work of William Perry and Lawrence Kohlberg in ethical development. Both of these figures, working within the framework of dimensional scaling, have created matrices that allow one to use comparative scales to make evaluations of moral and ethical development. Since their system is indeed general, we can apply the technique in a variety of areas. According to their schema, it is possible to make judgements about the underlying nature of the communication task by assessing the evident purpose of the finished document. For instance, language used solely as a tool of production (the process orientation decried earlier in this paper) is seen as a sign or symptom of very rudimentary language use. Language in this sense lacks development and engagement; it is Kinneavy's transparent text. At the opposite extreme, the other half of the pair, is language used as an analytical tool. In terms of language, words on a page, it is symptomatic of an attempt to understand the reality under consideration--a conscious tool. It is also a sign that language is viewed by both writer and reader, in this context, as a medium for personal growth. To go back to the lowest level for a moment, Language is seen in its simplistic form; it is transparent; it describes situations that are clear-cut dualities: good and bad, white and black. These situations are textually closed; interpretation is both unnecessary and impossible. It is also a communication situation that rarely exists beyond imperatives. At the other end of the spectrum, we find opaque texts that call attention to themselves as artifacts, art objects, objects of delight. Such texts are open in the most general sense; they invite interpretation and possess substantial and irrefutable ambiguities.

This sense of opposition, I think, is a fundamental premise that under-
lies much of our thinking about the role of technical writing and the
dilemma of humanistically trained writers in a technological profession. In
support of engineering's role as producer of artifacts, technical writing
has inherited some of the tensions, anomalies, and problems of that role.
Engineering, for instance adheres to the doctrine of objectivity which
has generated a variety of writing problems that define the limits of the
writer's role--personality, the presence of the author, and a discernible
"voice"; objectivity, fair treatment of facts and phenomenon; and linguistic
manipulation, using language as a tool to create illusion. For the sake of
brevity, I would like to take only one of these issues under consideration
in this paper--personality.

Personality, it seems to me, implies the presence of the writer as an
identity in a work while objectivity rests on an attitude toward material.
One can use the phrase, "I found that the sample weighed 128 grams," without
destroying the factual nature of the observed measurement. Such a statement
not only identifies the author, it places responsibility and, I suspect,
is exactly what makes engineers and others apprehensive about using first
person pronouns.

In effect, technical writing maintains two unwritten but implied
rules about personality: it is permissible and even desirable to ignore the
author's identity, voice, or stance; and the best method for communication
is to devalue the individual--as both writer and reader. The consequences
of such a position has implications both for communication and ethics. To
examine this problem we need to examine the role of the individual in a
technological society, the methods writers use to communicate in such a
society, and the relation of the reader to technical material.

I would like to suggest that we view the individual in a technological
society in Anatol Rapoport's terms of instrumental or intrinsic value. The
former simply means that an idea, object, or device has value because it
enhances something else that we value; the latter--intrinsic--means being
comfortable and alive. One can obviously guess that Rapoport sees the
instrumental value as inconsistent with humanistic and ethical concerns:
if individuals have only instrumental value to technology, as consumers then
they have no value. Lee Thayer offers a similar distinction, which neatly
applies Rapoport's terms to our needs, when he discusses the ethical role
of communication. For Thayer communication has two possible roles: social-
ization and individuation. Communication in the former sense relies on
people expressing and understanding themselves in the "proper" manner without
regard to fact; social "fit" is paramount, nothing else matters. (This
sense, for example, typifies scientific agreement about a particular pheno-
menon.) In contrast, individuation in communication is characterized by
language behaviors which see value (intrinsic value) in the individual. Tech-
nology, in either view, must be the receptacle of instrumental value, man
of intrinsic. Once one agrees to such statements, ethics assume a much
more dominant role in technological affairs, including communication.

Along with this revaluation of the individual must also come a re-
consideration of the author and reader in relation to technical information.

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Herbert Simon, for instance, posits an intriguing definition of a goal-seeking system (of which man is an example) that seems to me particularly appropriate to examining this relationship. Such a system, Simon maintains, has two channels (the old inner and outer environment in some ways): the afferent (sensory channels) which receive information and the efferent (motor channels) through which the environment is manipulated. Interestingly, Simon's observations parallel the work of Louise Rosenblatt who uses the term efferent in her theoretical discussions to describe the concepts to be retained after reading. While this use at first appears to be somewhat at odds with Simon's use of the term, I want to suggest that his efferent channel depicts ways of using the concepts retained by the afferent channel and, as such, both terms describe the same phenomenon as Rosenblatt's term. Rosenblatt, in fact, says that readers direct their response to referential prose outward [afferently in Simon's terms] toward concepts to be retained or actions which are textually determined.

An additional aspect of personality that must be dealt with concerns what Rosenblatt calls "selective attention." In selective attention, Rosenblatt claims that a reader adopts a focus of attention, a stance, and then selects responses relevant to the text based on that stance. She adds that this continuing process bestows interest on particular thoughts which then seem independent of consciousness; at this point the selective process sets the degree of awareness by weighting the potentiality of the text for both efferent and experiential import. The reader has the primary responsibility to manage this weighting process which, in actuality, is based on textual potential for engaging the reader in multiple, selective activities.

This sense of selectivity is at one with the concepts I discussed earlier. Selective behaviors, behaviors which define the ways in which information is actually processed, have the potential to define both the reader's and the writer's relationship to communication tasks. One does not, of course, see communication tasks as simple polarities; it is, however, possible to use this sense of polarity for good ends. One can take such paired opposites, add the element of personal interviews, multi-dimensional scaling, and ethical considerations to provide editors with a fairly descent and replicable definition of both the necessities of the writing task and the demands and expectations of the potential reader. One can also make judgements about the commitment and allegiances of both writer and audience, and, I think, place the field of technical communication squarely into a domain that has carefully defined characteristics regardless of regional aberrations. Unlike other, more subjective systems, this combination of techniques, all of which have a long history of demonstrable accuracy, has the potential for defining the field of technical communication with precision and humanity.

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MARKETING INFORMATION: THE TECHNICAL REPORT AS PRODUCT

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SUMMARY

For many R&D agencies of the federal government, including the National Aeronautics and Space Administration (NASA), the technical report constitutes a product, the primary means for communicating the results of their research to the user. The present environment of the technical report is vast, with considerable variance in report components, format, and organization. As part of the Langley scientific and technical information (STI) review and evaluation project, a review of the technical report as an effective product c information communication was undertaken. Style manuals describing the d practice in technical report preparation; publication manuals covering such factors as design, layout, and type style; and copies of technical reports were obtained from industrial, academic, governmental, and research organizations. Based on an analysis of this material, criteria will be established for the report components, for the relationship of the components within the report context, and for the overall report organization. The criteria will be used as bench marks and compared with the publication standards currently used to prepare NASA technical reports. The comparison may reveal changes which can be made to the existing NASA standards to improve the effectiveness of NASA's technical reports as products for information communication.

INTRODUCTION

The research and development (R&D) expansion, which began during World War II, resulted in significant changes in scientific and technical information (STI) activities in the United States. These changes, which were necessary to handle the increased production of STI, included new methods of publishing, disseminating, storing, and retrieving scientific and technical information. A significant change occurred in the way in which the results of research were published. During this period, the distribution of R&D activities changed from a complete reliance on traditional journals and monographs to the wide-spread use of the technical report (Adkinson, 1978).

Growth of Technical Report Literature

The technical report has also been used by industry to communicate significant and complete research results. Due primarily to the federal government's

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support of R&D activities and the associated need to record the progress and document the results of government-sponsored research, the volume of technical report literature has grown steadily. Approximately 15,000 technical reports were produced in 1965. A decade later, in 1975, the yearly total exceeded 60,000 reports. The projected production for 1980 was established at 80,000 reports (King, 1977). The number of U.S. scientific and technical literature items by medium is shown in Table A.
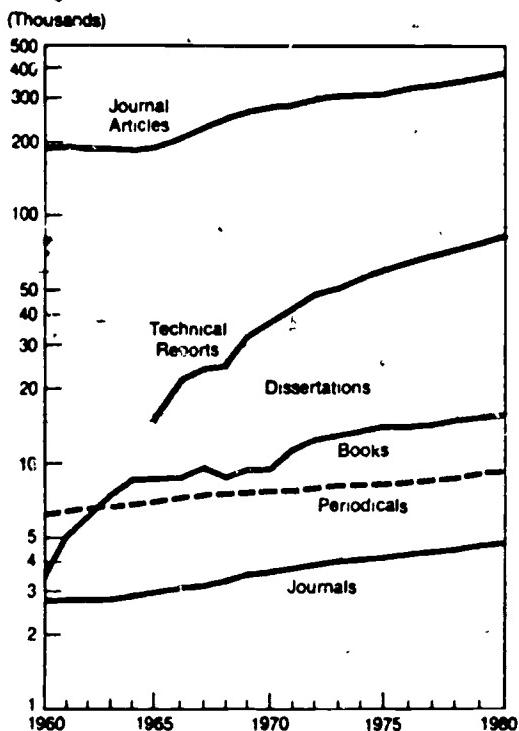
Table A. - Number of U.S. S&T literature items
   by medium (1960-1980)

For calendar year 1980, the National Aeronautics and Space Administration published 3,399 technical reports. Like many R&D agencies in the federal government, NASA regards the technical report as a product, the primary means of communicating research results to the user. Because of this function, NASA technical reports must be organized and written to accomplish the most effective communication of their contents.

NASA technical reports are processed into the NASA scientific and technical information system where they are distributed to industrial, academic, and public organizations; accessioned into RECON, NASA's computerized bibliographic data base; and indexed and abstracted in STAR, NASA's announcement publication for technical report literature. The NASA technical publications which are available for sale to the public can be obtained from the National Technical Information Service (NTIS) in Springfield, Virginia.

The National Technical Information Service was established as part of the Department of Commerce to simplify and improve public access to scientific and technical reports produced by federal agencies and their contractors. NASA

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technical reports, as well as those of other federal R&D agencies, are added to the NTIS data base. The NTIS data base may be searched through such commercial data bases as SDC's ORBIT III, Lockheed/DIALOG, and BRS.

Technical Report as Product

The technical report is a tangible product of a research effort. Although agreement exists that these reports should be organized, clearly worded, and easy to use, report producers disagree on (1) the definition of the technical report, (2) the role of the technical report in the scientific and technical environment, and (3) the arrangement of the parts of the technical report.

The definition of the technical report varies because it serves different roles in communication within and between organizations. The technical report can be defined etymologically, according to the derivation of "report" (Weisman, 1966); descriptively, according to the report content and method (DoD, 1964); behaviorally, according to the influence on the reader (Ronco, 1965); and rhetorically, according to the function of the report within a system for communicating scientific and technical information (Mathes and Stevenson, 1976).

In 1968, COSATI (Committee on Scientific and Technical Information) assembled a task group which appraised the role of the technical report in the scientific and engineering communication process. The technical report was found to be the primary recording medium for applied research and thus favored by the technologists. The technologists saw great merit in a number of features of the technical report including (1) timeliness, (2) comprehensive treatment, (3) inclusion of ancillary information, and (4) the frequent inclusion of negative results. On the other hand, the COSATI study found that scientists questioned the reliability of the technical report because of its allegedly unreviewed nature and its availability through a retrieval or archival system.

Publications manuals representing a cross-section of the scientific and technical community were examined in an attempt to discover a standard arrangement of components recommended for inclusion in a technical report. There was little agreement about the inclusion or the arrangement of components. A matrix illustrating the variety in these documents is included as an appendix.

STATEMENT OF THE PROBLEM

In February 1980, the Scientific and Technical Information Programs Division undertook the first comprehensive review and evaluation of the Center's STI program. As part of the project, a study of the technical report was undertaken to determine whether the NASA publication standards of style and organization made the technical report an effective product for transmitting information.

Purpose of Study

NASA employs uniform publication standards designed to ensure the clarity, quality, and utility of its technical reports. These standards were designed to

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produce reports of maximum readability and ease of comprehension, written in a style that is both logical and familiar because of its wide acceptance in technical writing. However, an evaluation of NASA publication standards had never been conducted.

Importance of the Study

A survey of the literature disclosed that little, if any, documented research existed to support or suggest criteria for assessing the effectiveness of a technical report. Consequently, a survey to establish the present environment of the technical report and to produce empirical data against which NASA publication standards could be compared was deemed essential. This paper reports the preliminary findings of t' ` study.

RESEARCH METHODOLOGY AND PROCEDURE

The study utilized survey research to obtain input from organizations which were known to produce technical information. Addresses were compiled from two sources: the Society for Technical Communication (STC) membership and NASA's distribution list for technical reports. The study was conducted in conjunction with the firm of Graffic Traffic Studios, located in Norfolk, Virginia.

Limitations of the Study

For purposes of this study, the technical report was defined as a communication product designed to convey the comprehensive results of basic and applied research together with the ancillary information necessary for interpretation, replication, or application of the results or techniques. The study was limited to those technical reports which recorded significant scientific or technical accomplishments and which were specifically prepared for distribution outside of the originating organization. Thus, in-house memo/letter reports, the corporate "proposal," institutional reports such as periodic reports or annual reports, and the contract progress report were eliminated.

Procedure

A letter was sent to individuals representing 611 organizations in industry; academia; government; and research, trade, and professional associations. The individuals were asked to provide the following:
1. Copies of typical reports published by their organizations;
2. A copy of their style manual or the name of the commercially prepared manual (e.g., Chicago Manual of Style) if one is used;
3. A copy of the publications or graphics manual or standards covering such factors as design, layout, typography style, illustrative material, printing, binding; and
4. A form indicating the absence or presence of the requested information.

Approximately 200 pieces of literature were received from 124 organizations within the established time limits. Ninety-nine technical reports were suitable for analysis and data extraction. The data were analyzed according to established criteria. No statistical inferences were made from the findings.

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Of the 611 organizations contacted, 99 respondents sent material suitable for analysis and data extraction. The overall rate of return for the survey was 16.3%.

Survey Response

The 99 responses were grouped according to organization. Industrial organizations constituted the largest group in the survey population; followed by the research, trade, and professional organizations; government organizations; and the academic organizations. This grouping is shown in Table B.

Organizational Type	Requests	Responses	Percent Responding	Percent of Total Survey
Government	49	12	26.6	12.2
Industrial	426	54	12.6	54.5
Academic	76	11	14.4	11.1
Research, Etc.	60	22	36.6	22.2
TOTALS	611	99	16.3	100.0

Table B. - Survey responses by organization

Components - Their Use and Location

The material was analyzed to produce an exhaustive list of report components. Ninety-eight report producers described structural components using 98 different terms. In compiling the list, those terms which appeared to describe components having the same function were grouped. An analysis of the frequency of usage of the components disclosed that only five components were used by 50% or more of the responding organizations (see Table C).

Next, the material was analyzed to determine the location of the components within the report. No standard sequence was discovered because the components were located in almost every possible position within the report. No convention was discovered for describing the various sections of the technical report. Therefore, the three areas of traditional book publishing: front matter, body, and back matter were used to locate the components. (The front matter consists of all material preceding the main text. The body contains the investigative, analytical, or theoretical material. The back matter consists of reference material and other supplementary matter.)

Five components (cover, title page, table of contents, introduction, and appendixes) were mentioned by 50% or more of the respondents. Only the cover and the table of contents were consistent in their location within the report.

Less agreement existed about the location of the title pages, intr iuction, or appendixes.

The components in the exhaustive listing were refined so that they could be compared more easily with the components covered by the NASA Publications Manual. Components which appeared to have the same function were combined. For example, "List of Drawings" was combined with "List of Figures." Any component mentioned by NASA was included. The number of components was also reduced by eliminating any component used by fewer than five report producers.

The components derived from the exhaustive list were compared with the components and their recommended placement as specified in the NASA Publications Manual. The components and their placement as specified by NASA compared favorably to those contained in the refined list. The analysis did reveal variations in the number and placement of front matter components. Where body components were concerned, NASA placed the same elements in the body of the report as those contained in the refined list. A comparison of back matter components revealed certain variations, most notably in the placement of the glossary and index.

A breakdown of the five components, the percentage of use, and their location within the report is presented in Table C.

Component	%Use	Front	Body	Back
Cover	67.6	100.0	---	---
Title Page	80.0	96.2	2.5	1.2
Table of Contents	70.7	100.0	---	---
Introduction	57.5	17.5	82.4	---
Appendixes	59.5	---	1.6	98.3

Table C. - Components by use and location

Use of Style Manuals and Publication Guides

The respondents were asked to provide information relative to the use/non-use of style manuals and publication/production guides. Respondents were also asked to identify the use of commercially prepared style manuals. The responses were compiled and are presented in Table D. While the chart is phrased in use/non-use terms, mutually exclusive categories were not specified. Therefore, the percentages cannot be added to describe 100% of the sample.

	Chicago	AP	GPO	*Other Commercially Available Style Guide	Your Organization's Own Style Guide	No Style Guide Used	Publication/Production Guide	Do Not Use Publication/Production Guide
Government	16.6	16.6	83.3	33.3	41.6	25.0	58.3	41.6
Industrial	31.4	5.5	42.5	27.7	29.6	37.0	33.3	46.2
Academic	54.5	27.2	27.2	36.3	18.1	45.4	54.5	54.5
Research, Etc.	59.0	13.6	50.0	27.2	31.8	31.8	40.9	50.0
Total Survey Average	38.3	11.1	47.4	29.2	30.3	35.3	40.4	41.6

*DeBakey, The Scientific Journal: Editorial Policies and Practices; NASA Publications Manual; NBS Communications Manual; Abbreviation and Symbol Guide; New York Times; Reisman's Style Manual for Technical Writers and Editors; "Guidelines to Format Standards--COSATI"; STC Typing Guide for Math; American Psychological Association; Editorial Manual of the AMA; Strunk & White's, The Elements of Style; Handbook of Current English; Words Into Type; CBE Style Manual; Turabian, Manual for Writers; ANSI/IEEE Std 260-1978; Geological Survey Style Manual; AIP Style Manual; ACS Style Manual; SMART Communications Inc.; MLA; Fowler; Baker; UPI Style Manual; National Education Assoc.; American Institute of Physics; Technical Manual Writing Handbook; Technical Writing Style Guide; Guide for Beginning Technical Editors; Swanson, Math Into Type; American Chemistry Society, Handbook for Authors.

Table D. - Use of style manuals and publication guides by organization

The majority of respondents relied upon a style manual to prepare technical reports; however, approximately 33% of the respondents used no style manual. The GPO manual was used by the majority (83.3%) of respondents from government operations. A majority of academic and research respondents, 54.5% and 59% respectively, used the University of Chicago Press' Manual of Style in report preparation. Respondents were almost evenly divided in the use/non-use of a publication/production guide.

SUMMARY OF THE STUDY

The study represents an attempt to assess the NASA technical report as an effective medium for information transmittal. The evaluation included the compilation of empirical data through a survey of report producers and through a survey of report components, formats, and organization following a study of current style manuals.

A survey of the literature disclosed that little, if any, documented research existed to support or suggest criteria for assessing the effectiveness of a technical report. Consequently, a survey designed to determine the present environment of the technical report and to produce empirical data against which NASA publication standards for technical reports could be compared was deemed essential.

During the analysis of the findings of the study, wide variances in the technical report were discovered. Nearly one hundred components were identified, based on the extensive array of terms. An attempt to reduce the number of components was made by combining similar components under one heading and the elimination of seldom used component terms. No standard sequence was discovered for the components, so only a general location for them could be made in terms of front, body, and back matter.

FUTURE RESEARCH

Future research will assess the adequacy of the reduced set of components, clearly define the purpose of each component, and develop evaluative criteria for each. The components of the NASA reports will be evaluated according to these criteria. Based on the tabulation of locations in common usage, alternate theoretical sequences of components will be developed and tested empirically. The NASA report will be tested against the sequence established by research.

CONCLUSIONS

The number of technical reports has increased steadily since the expansion of R&D activities began in the U.S. during World War II. The statistics compiled by Donald King for the National Science Foundation project the continued growth of this communication medium. For many R&D agencies of the federal government, the technical report is their product, the primary means used to transmit the results of their research to the user. Viewing the technical report as product, agencies of the federal government have created the necessary systems for disseminating, storing, retrieving, and otherwise making this medium available to the scientific and technical community.

The work by COSATI represents a significant treatment of the role of the technical report in the total STI communication process. While the work by COSATI represents a definitive treatment of the technical report, it did not address how to make the technical report more effective in communicating information to the user. The COSATI report recognized the need for, but stopped short of recommending uniform standards designed to enhance clarity, quality,

and maximum utility. Many organizations such as NASA have developed publication standards to ensure clarity, quality, and utility of their reports and to prescribe the inclusion and arrangement of the components. The review of the literature revealed that bench marks for evaluating some of the components have been established. However, no critical evaluation of existing publication standards has been undertaken.

The preliminary findings of the NASA study revealed that (1) nearly one hundred components were used, (2) there was an apparent lack of consistency in the terms used for the components, and (3) there was an apparent lack of consistency in the location of the components. Further analysis and review of existing publication standards should be undertaken. Criteria for existing report components should be integrated and synthesized to establish a uniform standard for those components. Evaluative criteria should be developed for those components for which no criteria exist. Depending upon the purpose of the report and the audience, a standard for including specific report components should be established. Next, the proper sequence of the components should be determined. An empirical testing of these standards should be undertaken to ascertain the most effective choice and arrangement of components for transmitting information to the user.

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APPENDIX. - COMPARISON OF SIX STYLE GUIDES FOR NUMBER AND ARRANGEMENT OF COMPONENTS

COSATI	U S GEOLOGICAL SURVEY	HOW TO WRITE AND PUBLISH A SCIENTIFIC ARTICLE	APA PUBLICATIONS MANUAL	NATIONAL ACADEMY OF SCIENCES	NASA PUBLICATION GUIDE
Front Cover	***	***	***	Cover	Cover (but not described)
***	***	***	***	[Half-title page]	***
***	***	***	***	Frontispiece	***
Technical Report Standard Title Page	Title Page	Title	Title	Title page	Technical report standard title page
(with parts abstract, authors, etc.)	(with parts title, author)	List of authors and addresses	Author		(with abstract, title, authors)
***	***	***	Author's institutional affiliation	***	***
***	***	***	***	***	***
***	Frontispiece	***	***	[Verso title page]	***
***	Foreward	***	***	***	Foreward
Preface	Preface	***	***	Foreward	Preface
***	***	***	***	Preface	***
***	***	***	***	Acknowledgements	***
Table of contents	Table of contents	***	***	[Committee of panel members]	
List of illustrations	List of illustrations	**	***	Letter of transmittal	Table of contents
List of tables	List of tables	***	***	Table of contents	***
List of abbreviations and symbols	***	**	***	List of tables and figures	***
***	Glossary (signs and symbols)	***	***	***	***
***	Abstract	Abstract	Abstract	***	***
Introduction	Beginning	Introduction	***	***	[First page of text]
Main text	Presentation of data	Materials and methods	***	***	Summary
Headings	Headings	***	Introduction	Introduction	Introduction
***	Footnotes	***	Method	***	Symbols and units
Numbering systems	***	***	***	***	Main Body
***	***	***	***	Body	Headings
***	***	***	***		***
Conclusions	The end	***	***	Headings	***
***	***	Results	***	Footnotes	***
***	***	Discussion	***	***	Descriptive information
Recommendations	***	***	***	***	Mathematical presentations
Appendixes	Reference list	Literature cited	***	***	***
Glossary of terms	Appendix	***	***	***	Results and discussion
References	***	A knowledgements	Results	***	***
***	***	***	Discussion	***	Concluding section
Index	Index	***	***	References and notes	***
Illustrations	Illustrations	***	References	Bibliographies	Appendixes
	Plates		***	Appendixes	References
	Figures		Appendix	***	***
	Captions		***	Glossaries	***
Tables	Tables	***	***	Indexes	Tables
Equations	***	***	***	Tabular and graphic material	
Composition	***	***	Tables	Tables	
Workmanship				Illustrations	
				Half tones	
				Figure caption	
			Figures, graphs, illustrations	***	Figures
					Photographs
					Drawings
			***	Mathematics	Graphs
				Symbols	***
				Equations	
			***	***	Numbered items
			***	***	Makeup
			***	***	Page dimensions
					Typography

Note: *** asterisks indicate either complete absence of a particular component or absence of the component at a given location

Panel A-13

The Case Method in Technical Communication

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THE CASE METHOD IN TECHNICAL COMMUNICATION

Elizabeth R. Turpin, Chair
Houston Community College System

Welcome to Session A-13, "The Case Method in Technical Communication."
My name is Elizabeth R. Turpin, of the Houston Community College System, and
I will be serving as your Chair for this afternoon's session. Your Associate
Chair is Pauletta Krum, of the Northeast Technical Community College, Norfolk,
Nebraska. We feel we have an unusually interesting session for you this after-
noon, one which should offer useful information and stimulation to all of you,
whether you are old hands at teaching technical communications or are still
concerned about what to teach on Monday morning.

One reason this session is a bit different from the usual conference pro-
gram is that instead of being a group of papers submitted independently and
selected to go together on the basis of a common topic, these papers constitute
the results of a year of intensive work by the speakers as the members of the
Casebook Committee of the Association of Teachers of Technical Writing (ATTW).
Today's papers offer a cohesive view of what a case is, how one should be con-
structed, a look at what a comprehensive, "holistic" case is like, how to use
cases in the classroom teaching of technical communication, how students have
responded to the use of cases, and the argument for the use of cases rather
than the standard research approach using the library. At the request of the
Committee, it is my pleasure to extend to all of you the invitation to submit
case studies to elicit reports, letters, proposals, and illustrations/graphics
from students in technical communications in two- and four-year college classes.
These cases, which will be considered for publication in an anthology of case
studies to be published by the ATTW, can be based on a variety of technical
subjects (in science, engineering, general technology, etc.) as well as being
directed toward students with a variety of technical backgrounds and levels of
expertise. Inquiries and manuscripts should be submitted by November 1, 1981,
to John Brockmann, Division of Technology, College of Engineering and Applied
Sciences, Arizona State University, Tempe, AZ 85281.

The members of the committee, and your speakers this afternoon, include
John Brockmann, Chairman, to whom we owe the organization and development of
the session today; Jone Goldstein and Barbara Couture, Wayne State University;
Susan Feinberg, Illinois Institute of Technology, Chicago; Marcus Green, Cin-
cinnati Technical College, Ohio; and Susan McDonald, St. Louis Community Col-
lege at Meramac. During the remainder of this introduction, I will be giving
you some added background about each speaker and his or her topic for today's

session. Today's papers, though shortened for the oral presentation, represent material to be included in Technical Communication Casebook,I.

. . Our first speaker this afternoon is John Brockmann, who will be explaining what a case is in the course of his topic, "The Case Method and Technical Communication Pedagogy." John currently is an Assistant Professor for Technical Communications at Arizona State University. He is co-editor with Paul Anderson and Carolyn Miller of an essay anthology, New Essays in Technical Writing and Communication to be published in 1982, in addition to authoring several recent journal articles in technical communications. John, who also has chaired the ATTW's Technical Writing Casebook Committee, is a consultant writer and in-house trainer with Sandra Pakin and Associates in Chicago; Words Unlimited in Phoenix, Arizona; and the United States Civil Service Commission.

In showing how the case method is an effective way to present real-life communication problems to students in order for them to orient to the decisions they will have to be making on the job in order to communicate effectively, John outlines the case method by: (1) defining the discrete features of cases in technical communications, (2) describing the philosophy of the case method, and (3) providing a comprehensive annotated bibliography. Having cases for students to work with gives some real-life dimensions to otherwise highly artificial assignment situations in the technical communications classroom. Teachers, for the most part, have not had available information on how to construct cases for themselves, and it is often not feasible for classes to make extensive field trips. John will be discussing the six discrete features of a case in technical communications which are important: (1) verisimilitude, (2) fullness of the rhetorical context, (3) emphasis on communication as a problem-solving technique, (4) focus on communications, (5) interconnectedness of theory and practice, and (6) difficulty, incompleteness, and openness to divergent solutions.

In applying all of these characteristics to the development of a useful case, the focus will lie in making the case a base for effective, relevant rhetorically based communication assignments to develop the ability of students to analyze needs and communication strategies to meet reader expectations in a responsible way. Because of the realistic base for good cases, students will be able to correlate effectively theory and practice in their communication assignments using a case devised on the above principles. Examining the various sources which John has brought together and annotated provides a wealth of added resource material from both technical and business disciplines.

Our second speakers are Barbara Couture and Jone Goldstein of Wayne State University in Detroit, who will be jointly presenting the topic of "How to Develop and Write a Case for Technical Writing." Barbara Couture is the Assistant Director of Composition at Wayne State while Jone Goldstein is the Coordinator of Technical Writing at Wayne, and both teach technical communication for engineers. Together they have been developing and writing cases for the past two years; recently, their casebook text has been accepted for publication. For the ATTW casebook, they have developed a full-scale "holistic" case, and a set of procedures for casewriters to use in preparing technical communications cases. Their paper here highlights both a case and casewriting procedures. In describing the case and steps to use, Couture and Goldstein explain that a

case needs to include a cohesive persona of a technical professional, reflect the entire technical writing context and process, include narrated and dramatized but realistic technical and professional details of a completely factual situation, and be presented in the form of a case upon which realistic communication assignments can appropriately be based, ones which will challenge the student to resolve a communications problem effectively. The four major stages to be discussed today by your speakers include: (1) design the case, (2) collect the facts, (3) create the fiction based on the facts to develop the case, and (4) actually construct the case. Couture and Goldstein also recommend testing the case, as they have done, to assure its usefulness and validity.

To assist the user/developer of cases, Susan Feinberg, your next speaker, devised an instrument and used it to explore student attitudes statistically. Susan, whose topic this afternoon is "Evaluating the Effectiveness of the Case Method," is Director of the Technical Communications Program at Illinois Institute of Technology, where she has taught communication and writing since 1964. She has h experience in preparing and editing technical proposals and reports, as well as having published articles on technical writing for technical, medical, and communication journals. She has also conducted writing workshops in proposal and technical writing, in addition to being a writing consultant for the Educational Testing Service, Princeton, New Jersey.

Susan will be discussing an instrument she designed and tested which is based on a self-report questionnaire based upon the Writing Apprehension Test developed and tested by Daly and Miller (Research in the Teaching of English, 1975). The questionnaire's 26 items reflect three categories which encompass ideas and skills usually taught in technical communication programs: (1) rhetorical principles, (2) planning strategies, and (3) drafting skills (including ability to use data and to communicate in writing). Susan will be showing not only the results of the tests which were conducted, but the way in which the instrument was designed and validated. The pilot study she reports on suggests that an empirically-based, standardized instrument may be used to measure change in student attitude toward technical writing.

Our next speaker, Marcus Green, of Cincinnati Technical College, Ohio, is currently an instructor whose primary job is teaching composition and technical writing to engineering technology students. He has pent considerable effort in improving and developing this course, and has presented two formalized papers in this area, one in 1976, which explained course objectives, and one in 1979, Re-Evaluation and Adaption--Revising a Course to Meet Graduates' Needs. In his paper this afternoon Marc will be discussing, "Using Case Studies to Teach an Engineering Technology Technical Writing Class."

Marc points out n his paper that students need to be aware of the objectives of a technical communications course and of how cases help to achieve them. He advocates focusing on students recognizing how to solve communication problems, identify audiences, plan written communications, present them properly and use visual aids properly. Marc explores the process of role-playing and developing case discussions to help students utilize their own intelligence, skills, and past experience in reviewing, analyzing, evaluating, selecting data and alternative solutions, etc., in planning their communications based on

cases. The successful solutions, Marc explains, are based on the students'
ability to deal with facts and figures based on a set of criteria, but will
vary from student to student. The discussion this afternoon suggests a rating
system based on standards for evaluating case solutions to determine how well
they meet the assigned rhetorical tasks as well as the various managerial tasks
also found in many cases.

The last speaker   afternoon is <u>Susan McDonald</u>, of St. Louis Community
College at Meramac, whe   she is an Associate Professor of English. Susan
has had experience as a program director of an interdisciplinary studies pro-
gram, plus other activities as a newspaper journalist, Fulbright Exchange Teach-
er, National Endowment for the Humanities Fellow, and Modern Language Associa-
tion Fellow. In her presentation this afternoon, Susan explores some addition-
al rationale concerning the use of case studies in her topic, "Why Use Case
Studies Rather Than Simulation-Gaming Techniques or Library Research?"

In her presentation, Susan emphasizes that, despite the focus on teaching
initiative and creativity through simulation-gaming techniques and library
research, case studies, she believes, provide greater opportunities for students
to develop good skills as researchers and writers through experience in the
problem-solving dimensions as they relate to real-life communication tasks.
Susan also outlines some effective approaches to teamwork use of case study
assignments, plus the opportunity to monitor or regulate reading level and
comprehension by students. She explains that other positive aspects of using
case studies relate to more realistic thinking and composing processes, includ-
ing choice of organization and format. Such choices, through the use of case
studies, she points out, tend to have greater relevance for the student who is
utilizing the case study approach. Likewise, the student is really being ul-
timately better prepared to make such choices he or she will be faced with in
real life as a working writer in solving communication problems.

- In our session this afternoon, we have asked tha' you lend us your ears
as we journeyed through the development and use of the case study process in
teaching technical communications. Now, in the time remaining, we invite your
questions, and if we run out of our allotted time, members of the speaker panel
will be available to continue answering questions on a person-to-person basis.
Thank you for your time, interest and attention to the presentation of the case
study approach to teaching technical communications.

WHAT IS A CASE?

R. John Brockmann
College of Engineering and Applied Sciences
Arizona State University

ESSAY THREE

THE CASE METHOD AND TECHNICAL
COMMUNICATIONS PEDAGOGY

The case method is an effective way to present real-life communication problems form the commerical world in tehcnical communications classrooms. This essay outlines the techniques of this method by:

*   Defining the discrete features of cases in
     technical communications;

*   Describing the philosophy of the case method;
     and

*   Providing a comprehensive annotated
     bibliography.

* * * * * * * * *

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The Problem

The case method can be one of the most effective wa. to integrate the commerical world with the academic world. Classes may not be able to visit industrial sites physically, yet the communication problems of industrial sites can daily be brought into the classroom in the pages of a case. Recent textbooks such as Coleman and Brambley's The Technologist as Writer (Random House, 1978) and Blicq's Technically Write (Prentice-Hall, 1972) have capitalized on the case method by including sections employing it for writing practice.

However, as far as the classroom teacher is concerned, the textbook cases seem to have appeared magically, the production of textbook writers' esoteric knowledge. The teachers cannot produce cases for their own students because there are no articles, books, or courses which explain how cases are produced--at least there seem to be none. As a result, teachers are left with a few textbook cases that are soon over-used and out-of-date. So long as the methodology of the case method remains in the hands of a few textbook writers, the case method falls far short of its promise.

This essay intends to begin putting the methodology of the case method in the hands of the practicing technical communication teacher. This essay has three objectives:

* To define six discrete features of the most effective classroom cases;

* To describe the philosophy of the case method so that teachers can see how the case method can be adapted to their own use; and

* To provide a comprehensive annotated bibliography on the case method, including analytic articles and casebooks from technical communication, as well as those from three other closely allied disciplines--engineering, business communications, and general composition.

The Definition of a Technical Communications Case

Six features can be used to describe a case in technical communication. Before going into these individual parts, one needs to observe a complete example of a technical communication's case. The next few pages come from James Brown's 1961 book, Casebook for Technical Writers. This book is the only published technical communication casebook, and it offers teachers in the 1980's the best model to imitate. The specific case from this book, which is used as an example in this essay, is a relatively short case concerning an Air Force surplus fuel valve. The case, reproduced in facsimile on the next few pages, is entitled "Dwight D. Duane and the Automatic Shutoff Valve."

Dwight D. Duane
and the
AUTOMATIC SHUTOFF VALVE

Background Required:

Section I — General
Section II — Basic Electricity

I

Your name is Dwight D. Duane, and, at the moment, your address is the Chloride Pilot Installation, Yarbron Corporation, Box 361, Kingman, Arizona. Not that you're anywhere near Kingman—you're up in the country north of it, beyond the little town of Chloride It's a wild and lonely place, and nobody has ever told you why Yarbron decided to put their pilot installation out here. It *could* be because some of the stuff you are working with is tricky business. At any rate, here you are.

Your boss's name is Phil Marlowe; he's a hot-shot physical chemist from some place in the East—M.I.T., probably. His boss is Doc Sunders, Chief of Research and Development, who thought up the pilot installation in the first place. A couple of dozen other people are around the place—technicians, a few typists, etc. You figure you're about halfway up (or down) in the pecking order.

Right now the place has turned into a madhouse, as you all knew it would, because, for some reason, the Yarbron officials have decided to move the pilot installation—lock, stock, and tower—to another location, near Bakersfield, in California. They want to label all the parts, ship them to Bakersfield, and put them back together.

You're minding your own business—finishing up the summaries of the last 22 runs—as calmly as anyone could in the circumstances, when Phil barges in on you.

It's an emergency, of course. So you go with Phil to his office, and on the way he explains. The entire plant has to be described so accurately

Figure 1. Facsimile of Case from Casebook for Technical Writers

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that the Bakersfield boys can put it together and start it operating as soon as the pieces arrive, without ever having seen them before. The trucks are scheduled to begin carrying the disassembled plant away the next morning; all records of what goes where have to be made before then, because those boys will take things apart faster than a tornado. Phil must leave in two hours for a Yarbron meeting in Los Angeles, Sunders is already in Los Angeles, and nobody else knows enough about the main shutoff valve to handle the job of telling anybody about it. You propose several objections to the idea of your doing anything about this problem, but Phil has thought of all of them—and not one does you any good.

"It's really a simple enough matter," Phil says. "I'll explain the valve to you; you write it up, because I don't have time to and nobody else can; and Bakersfield will be just as happy as if it knew better."

It turns out that the valve governs the flow of toluene to the main pilot unit. It sits under the toluene supply tank, Phil tells you, with only a little pump between it and the tank; and all the toluene that goes into the pilot unit must go through that valve, "It lets us stop things real fast, if we have to," Phil says. "Air Force surplus. Came off the fuel system of an airplane."

He takes you to his office in the control shack. He says, as you go in, that what they need is a write-up which tells what the valve is, what its major elements are, how it operates, and how to remove and replace it.

"It's a gate-type valve," Phil says, rummaging in his desk. "Here's an illustration of it." The illustration looks like this:

MOTOR UNIT LATCHING LEVER

DRIVE KEY

MANUAL OPERATING KEY

DRIVE KEYWAY
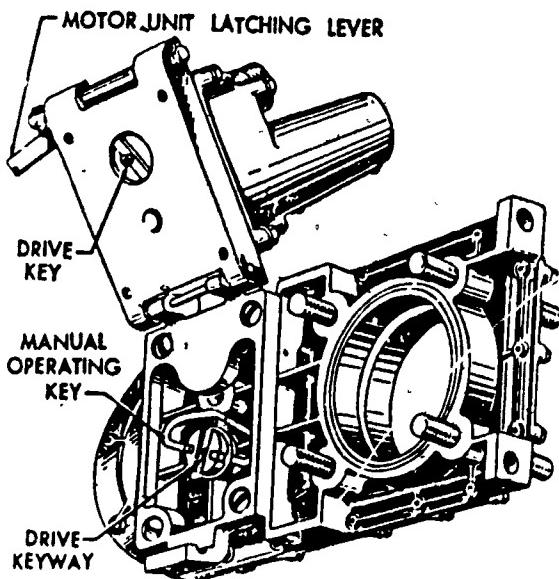
Figure 1   (cont.)

"It's called a shutoff valve; it's motor-driven, as you can see, and it has just two positions—open and closed. In the terminology, that's non-modulating It fits 2-inch tubing; and there's a kind of flange that goes over the tubing and onto these four bolts that are sticking out here on the right side of the picture. That fit is sealed with an 'O' ring—you can see here where it fits onto the valve." And you guess, by looking, that the same thing happens on the other side.

"Now," Phil says, "it's a little tricky because of that non-modulating characteristic. The valve gate is operated by some gears in there; and when you rotate this thing with the drive keyway and the manual operating key on it through 180 degrees, that's called a 180-degree rotation of the valve But what really happens is that this gate visible on the left slides across the opening where the tubing bolts on. Get it?"

You have to admit that you get it.

"That's what the manual operating key is for—so you can shut the thing off if the power goes out. But we've never had to use it," Phil says. "Now, this motor housing drops down and latches here on the bottom: you just lift up this latching lever, let this bar on the bottom of the motor unit fit into the hook on the bottom of the valve body, and then push the latching lever down. But make sure the drive key and drive keyway are both at the same place—open or closed—or it won't indicate properly on the control panel. They'll each be at one end or the other of the 180-degree swing, of course." Then he looks at you suddenly. "Unless something's jammed," he adds, as if he just thought of it.

You decide you'd better begin taking some notes; so you stop Phil long enough to get a pencil and some paper from his desk.

"Now the motor unit," Phil says—he seems to be in a hurry. "The motor unit has another tricky little bit to it because of the non-modulating characteristic of the valve operation. The motor also rotates through only 180 degrees; it's non-modulating, too. A couple of switches inside the motor unit case stop it at each end of that 180-degree swing. They're called the open and close position limit switches."

Somehow you are moved to comment. "The top of the rotor never gets to see the bottom of the stator, does it?" and all you get for it is a dirty look.

"Being from an airplane," Phil says, "it is, naturally, a 24-volt d-c motor . . ."

"Naturally," you say.

He ignores you. ". . . and it is, of course, removable from the valve unit by removing this little rod here where it hinges."

"Fine," you say. "I've got it. Is that all?"

"No," he says. "There's just a little more."

And it turns out that there is.

Figure 1 (cont.)

"Now, you can't see it very well on the illustration," Phil says, "but there's a place for four electrical connections on that motor unit."

"Four?" you say, a little incredulously.

"Son," Phil says, "there's always at least four connections on *anything* that works automatically. That's known as Marlowe's law, for the brilliant guy who discovered it." And those connections, you learn, require some explaining. "As I said, it's a 24-volt, d-c system," Phil says. "The motor has to get those 24 volts, and that's two leads—they're labeled MOTOR IN-PUT on the case there. One of those leads goes to the generator unit, the other to the switch here on the control panel; and from that switch one lead goes to the other side of the genera~r." He pauses while you jot awhile. "OK?"

"OK," you say.

"The motor will run if we turn on this switch," he says, indicating the control panel. The switch is a toggle affair, with the words MAIN SUPPLY VALVE under it and OPEN on one side and CLOSE on the other. "But when it's run just so far, it'll hit one of those limit switches. The switch will shut off the motor and reverse the polarity, so it'll run back the other way when it's turned on again. The polarity reversal is a fairly simple matter; it's all contained there in the case with the switch itself, and the motor lead-in lines really go to that reversal switch first. But the shut-off business is a little more complicated. For that we've got to operate a relay here on this control switch on the panel; and that relay, anytime it operates, sort of re-cocks the control panel operating switch. Then, when the switch is flipped the other way, it really closes the connection to the motor again, and the motor operates."

"Yeah," you say.

"So we have two leads into the limit switches. They are the two d-c lead-in voltages, and they come off the motor input leads. They come out as limit switches' output: one from the open limit switch, called the OPEN OUTPUT, and the other from the close limit switch, called the CLOSE OUTPUT. The one from the open limit switch leads to an OPEN indicator lamp on the control panel and to the relay on the main control switch—it's a parallel connection. Both the indicator lamp and the relay have leads coming out of them to the other side of the generator. And the same thing goes for the close limit switch, except it goes to the CLOSED indicator lamp on the control panel."

"Well, maybe," you say.

"Of course," he adds, "inside the motor case, the two leads into the limit switches each hit both switches."

"Sure," you say.

Figure 1 (cont.)

"So the whole thing winds up like this," he says. "I can open the valve by putting the control panel switch on OPEN. When the valve is open, the OPEN light goes on, the motor stops, and everything is hunky-dory. Then, when I want to close the valve, I flip the control switch to CLOSE, the OPEN light goes out, the motor runs until the valve is closed, the CLOSED light comes on, and the motor stops. And vice versa. Neat, huh?"

You suddenly realize that the guy is *proud* of the way that valve works.

But he apparently doesn't have time to stick around. In three more minutes he's gone. Then he sticks his head in the door about forty seconds later. He is out of breath and has obviously been running.

"I forgot to tell you," he says, "there's a two-way relief valve in the body of the valve proper—to allow for thermal expansion of the stuff trapped in the tube when the gate is shut."

Then he's gone for good.

APPLIED ASSIGNMENTS

1. After telling you all about the valve and dashing off, Phil calls you from Kingman. He was waiting for the plane, he says, when he remembered that he should have told you to write up a simple explanation of how to operate the valve from the control panel, along with a brief but very clear explanation of what was going on when the valve operated, and to be sure to include emergency procedures. All of this is to go into the control panel operator's instruction manual, and that operator is probably not the most brilliant man in Bakersfield.

   Write the material for the operator's manual. (A)

2. As far as you can tell, the person who's really running the place with Phil and Sunders gone is Christine, Sunders' secretary. It's Christine who gives you your first reasonably clear idea of what you're supposed to do about the valve.

   "What they're doing," Christine says, "is they're making up a sort of self-contained report for each piece of machinery in the whole pilot plant. It's Mr. Marlowe's job to put all the reports together and write up the general systems description. What they want from you is a complete, self-contained presentation of that valve, I'm sure. Description, operation, installation and removal, warnings—anything that somebody who's going to have to have it in his pilot plant might want to know. Mr. Marlowe's not going to Bakersfield, you know." And that's how you picked up the gossip on Phil's next assignment.

Figure 1 (cont.)

Now that you know generally what you're supposed to do, you can get to work. You dec. le first to present a sort of block diagram of the valve and control board sy tem, and after that the details about the valve itself. You find out that the valve has been assigned the symbol TR-3-112 in the general schematic labeling of the pieces of the plant, and that the control panel section related to the valve is CO-9-13. You can use these symbols for keys to label the whole report, so that Marlowe can put it in its proper place. The report, you figure, will be more like a description and instruction manual than anything else you've ever heard of.

Write the report. (B)

3. You complete your valve report, and Christine gets it typed in quadruplicate. Then Marlowe shows up one day, still in a hurry, and carries all the records and files away in a pickup truck. Three days after Marlowe's departure, you come into Sunders' office to clear up matters before your own departure, and Christine is waiting for you. "Mr. Duane," she says, close to tears, "somebody goofed."

This doesn't seem really remarkable, and you tell her so. Then she becomes a little hysterical and wails, "But it might have been me!" When she finally gets calm, she tells you that Albert Lederle, Superintendent of Development at the Bakersfield installation—who's even higher up in Yarbron than Sunders is—has just called from Bakersfield. He was in something of a snit because the dope on the main shutoff valve was not in the box of papers they received on how to assemble, adjust, run, and maintain that pilot plant. Lederle had said that this information was needed before morning, and somebody at Chloride Pilot Installation had better get it to him pronto, or heads would be dropping right *and* left. He was pretty emphatic, you gather. Christine says she is "*pretty* sure" the valve report was in the stuff Mr. Marlowe took off with him, but she doesn't really know—and she wails some more.

As usual, neither Phil nor Sunders is available for Lederle to get the dope from—so it's up to you. And you have only your set of notes and your memory of what went on while you listened to Phil and wrote the report. After thinking over what it is that Lederle needs and what you can give him, you drive to the Western Union office at Kingman and compose the clearest, most helpful, most informative, and most effectively organized telegram you've ever seen. You send it to Lederle collect, because the Chloride Installation budget has been recalled to Yarbron headquarters. And you get to sign your title to it, too: Assistant Design Engineer.

Write the telegram. (B)

Figure 1 (cont.)   *64*

4. You're sitting around waiting for your ride into Kingman—you're about the last man to leave the Chloride Installation area—and there's nothing much to do. Suddenly it occurs to you that the valve is complicated enough to have things go wrong with it. And when that happens, then what? you ask yourself. The answer is that you should have another valve to put in its place.

So you kill some time by writing a letter—or the draft of a letter, for Sunders' signature—to the Air Force Surplus Office nearest Bakersfield. In the letter you try to describe the valve so that the man behind the desk in the Surplus Office can tell you what you want to know—namely, whether it is now available, where it can be obtained, and how much it will cost. You don't know the address of the Surplus Office, but you figure you can get that in Bakersfield. And getting this letter done all except for the address might save some time.

Write the letter, for Sunders' signature. (A)

Figure 1 (cont.)

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Six discrete features of a case in technical communication can clearly discerned in this case. These six features are:

1. Verisimilitude

2. Fullness of the rhetorical context

3. Emphasis on communication as a problem solving technique

4. Focus on communications

5. Interconnectedness of theory and practice

6. Difficulty, incompleteness, and openness to deivergent solutions.

Each of these features is discussed below:

1. A Case Must Have Verisimilitude

The first characteristic of a good case is one which really distinguishes it from conventional textbook exercises. It is the verisimilitude of a case. Good cases have the feel of reality both in their content and in the followup activities students are called upon to perform.

Verisimilitude of content in cases is a great drawing card for cases because it makes instruction seem more relevant to students. Relevance motivates students to excel in their academic tasks as do few other teaching techniques. G. H. Flammer wrote about this quality of cases in Engineering Education when he said:

> One of the biggest benefits realized from
> case studies is the student perception of
> the reality of the problems and their relevance
> to his or her immediate professional practice.
> Perceived relevance is a strong motivator.[1]

However "perceived relevance" is not enough. Realistic "busy-work" is as useless to the student as the non-realistic "busy-work" offered in some conventional textbooks. Assignments which accompany cases must call upon the same complex of skills that will be called upon after graduation when students are on the job.[2] Verisimilitude in assignments means that skills called for by the assignments are not artifically isolated from one another, and that the whole communication task from invention to editing to layout is involved in the student's response.

The Automatic Shutoff Valve case illustrates the quality of verisimilitude in content and assignments in a number of ways. Names, dates, and even post office box numbers—all the minutiae taken for granted in

real life--are quickly laid before the reader and incorporated into the
problem. All the jibes and ironic repartee of Dwight and Phil display the
mark of hurried improvisation--improvisation usually absent in sterilized
textbook exercises. Facts and figures concerning valve engineering are all
present for the reader exactly as they would be for an expert such as
Dwight Duane in real life. The verisimilitudinous urgency of the case
invites the reader to participate in this fictionalized reality, to think the
way Dwight thinks. Finally, verisimilitude in the case assignments is clearly
evident in the choice of activities connected with the case: an operator's
manual, a report, a telegram, and a business letter.

Verisimilitude is an important feature of the case method, but it is
matched in importance by the second characteristic of cases, the fullness of
their rhetorical context,

2. A Case Must Give Students a Full
Rhetorical Context

Writers in the real world of business, commerce, and industry always
write:
      For a specific purpose,
      To reach a definite audience, and
      Within a definite role.
Cases must always include a purpose, an audience, and a writer's role if
they are to reflect communication in the real world. The Automatic Shutoff
Valve case includes this complete rhetorical context as illustrated by
assignment three. There the purpose of the communication is to ensure proper
operation of the valve in a production system. The audience for the
communication is the Superintendent of Development, Albert Lederle. And the
writer's role is one of an Assistant Design Engineer in a terribly tight
political spot.

These three rhetorical components of purpose, audience, and role are
the very elements that have been so sadly absent in standard textbooks and
conventional classroom exercises. By not confronting these basic parts of
a real writer's rhetorical context, textbook authors and classroom teachers
have handicapped student writers. Recently composition theoreticians have
given considerable attention to the effects of such an incomplete rhetorical
context on students.[3] This new theoretical awareness is an additional
impetus for employing the case method in the classroom. Critics may disparage
the verisimilitude of cases, claiming that it panders to misguided cries for
"relevance" in instruction. However, the completeness of a case's rhetorical
context gives case method proponents a systematic theoretical foundation.
As Wayne Booth pointed out so well in "The Rhetorical Stance," a student will
always find it difficult to write until "his rhetorical problem is solved,
that is, he has found a definition of his audience, his role and his
argument."[4]

Writing within a role while working on a case, however, is not an end in itself, as it may be in some sociological simulation-gaming. Rather, role-playing in a technical communication case is a means for developing conflict in the fictive reality of the case--conflict that increases the psychological involvement of students. Conventional textbook exercises do not invite personal involvement from students via role-playing; instead they deal with the student only as a student and do not stretch or challenge his view of himself and his capabilities as case roles do. By not inviting a student's psychological involvement in the assignment via role-playing, conventional textbook exercises become assembly-line artifacts--useful, but drab and artificial.

One additional point about cases and roles needs to be made. The role should be consistent in the narrative description of the case and in the assignments appended to the case. Often in the assignments appended to cases, case designers address the reader as a student and not in the fictive role that was so carefully developed in the narrative text of the case. If the case writer breaks the student's assumed role by the clumsy construction of assignments, all the drama and interest quickly disappear, and the case assignment becomes just another textbook assignment.[5]

The Automatic Shutoff Valve case is a model of how to invite the student reader to play a role. The very first word in the case is "your" and the continual repetition of these second person pronouns in the text of the case, slowly replace a reader's normal role with the fictive role. The style of the case is such that the student's activity of reading duplicates the course of his assumed character's thoughts. However, the development of the case is conventionally chronological so that is is not temporally confusing. Phil, the character's antagonist, is someone everyone has had experience with and someone everyone finds irritating. And, the informality of the language draws the reader into a more intimate identification with the character.

3. A Case Must Present a Problem Which Illustrates How Communication is Part of the Problem-Solving Process

Career-oriented students, like everyone else, have learned too well to compartmentalize their experiences. To them, only courses in engineering, business management, or statistics can provide tools to solve future on-the-job problems. English, writing, and technical communication at most, provide a method of recording the solutions to problems after the fact for files or government bureaucrats.[6] As the Automatic Shutoff Valve case clearly illustrates, however, effective technical communication is often the key to solving problems. Assignment four in the case calls for a letter requesting information from the Air Force concerning a replacement valve. This letter is not just meant for Saunder's files or to fill up Dwight's empty time. This letter is the only way to get availability and cost information from a person who probably will have difficulty giving the correct information without the part's specific piece number. No calculus

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formula, management theory, or engineering technique can replace an effective letter in this situation. Cases in technical communication must construct their communication problems so that students see that communication is a central aspect of problem-solving in the daily life of business and industry.

4. A Case Must Be Focused on Technical Communication

Case designers must not lose tract of their original goal--to teach technical communication --in their quest for verisimilitude. The goal is not to teach statistics or flow ratios even though a great quantity of such details would increase the case's versimilitude. Digesting and solving the technical details of a case should not take up an inordinate amount of the student's time. Rather, the majority of his time and effort must be spent on the problems of communication. This necessary factor of a technical communication case is well illustrated in the model case. The Automatic Shutoff Valve case gives the readers all the electronic, mechanical, and design features of the valve. Therefore, the student does not have to spend much time doing arithmetic or geometry in order to solve the problem.

5. A Case Must Embody a Functional Relationship Between Theory and Practice

Students must be able to "discover" widely applicable principles of effective communication through the working out of the particular case. Teachers should not expect cases to do the complete job of teaching basic communication principles. However, teachers should also not expect cases to leave students mired in the idiosyncracies and pecularities of the particular case. Communication principles must be intentionally interwoven into the fabric of the case. In fact, the writing of cases begins with the principles and leads to the particulars of the case not vice versa. Robert Weiss has observed this intentional interweaving of principles into the fabric of a case when he said at a Modern Lanugage Association convention panel in 1978

> . . . the structure of each case is determined
> by rhetorical precept and necessarily guides
> the reader-writer. Further, the implied percepts
> are intimately connected to the subjects the
> students write about and are given dramatic
> force by the case situation.[7]

The interplay between a case's verisimilitude in the particulars of the case and its theoretical purposefulness needs to be handled in a balanced way. Material for cases cannot be taken willy-nilly from the commerical world just because it is interesting material, not can the content of a case be totally fabricated. Rather, case designers must go out to the commercial world for their case material. Then they must carefully select and arrange that material according to the theoretical principles they hope to demonstrate with it.

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The interweaving of principle and particular ^an be seen in the very first assignment of the Automatic Shutoff Valve case The first assignment asks the student to write an operator's manual to the plant operator in Bakersfield. In writing a particular manual for a particular person, the student will quite naturally confront the ideas and principles of audience analysis, format considerations, graphics, and procedure writing.

<center>

ɔ.   A Case Must Be Difficult, Incomplete,
and Open to Divergent Solutions

</center>

Problems in the commercial world are difficult in part because they are usually surrounded by superfluous facts and issues. So it also is with a case. A case presents a problem surrounded by superfluous details. This requires students to be selective in the details they choose to use in solving the case. Conventional textbook exercises often diminish the need for student's critical selectivity by being overly sparing in the number of details they include.

Cases are also difficult because the narrative or descriptive presentation of the case problems is not the same rhetorical mode as the analytical or evaluative assignments they elicit. Because of this difference, students must become more rhetorically flexible, as they will have to be in the rhetorically mixed commercial world. Conventional textbook exercises are ^ften in the same rhetorical mode as the responses they seek to elicit, and ᴕus offer little challenge to the student's ɪlexibility.

However, even through there are usually superfluous details and issues in a case, there is also a great deal of incompleteness in a case. In the classroom someone always notices a missing fact or piece of data. This incompleteness becomes an asset in stimulating classroom discussion and in forcing the student to experience what so often happens to engineers or executives in the real world. It also allows them to use their imaginations. Like the real-life engineer or business executive, the student must develop logica¹ fictions in order to supply details and data that are missing. Case designers, however, need to be deliberate in the facts omitted from a case. There must always be a sufficient amount of data from which students can intelligently extrapolate these logical fictions.

Since extrapolation plays such a large part in the case method, ᴬ cases should also be solvable by divergent solutions. A case is necessarily open to divergent solutions because it reflects the intricate variables in real situations ᴠ ch usually defy the efforts of strict formulas and strict dog.as to solve them. Most often a compromise between alternative solutions is the most effective technique.

The Automatic Shutoff Valve case readily illustrates how a case is difficult, incomplete, and open to divergent solutions. Assignment three of the case is made difficult because the reader is inundated with such superfluous information as the type of vehicle Phil drives. Christine's

hysteria, her confusion regarding the whereabouts of the report, and the recall of the Chloride Installation's budget. The case assignment is also difficult because the narrative mode of presentation sharply contrasts with the analytical mode and abbreviated style called for by the telegram assignment.

Assignment three is incomplete because it fails to describe exhaustively the telegram's primary audience, Albert Lederle. How technically knowledgeable is he? What is his immediate communication need? With the audience and his needs largely unknown,[8] a wide variety of equally valid telegrams can solve the assignment's problem.

The six discrete features discussed above are the inner works of the case method. It should be clear from the discussion of these features that the methodology of the case method is not beyond the skills of an ordinary teacher. The next section on the philosophy of the case method reveals how easily the case method is suited to many current beliefs in education.

<center>The Philosophy of the
Case Method</center>

The case method is based upon a philosophy of education which posits change in the environment as an ever present factor. Since change is ever-present, an education sending students out into the world equipped only with a treasury of facts and skills is an incomplete education. A true education, according to this philosophy, not only gives students a treasury of facts and skills, but it also gives students the ability to adapt these skills to a changing environment. The case method requires the adaptation of a student's repertoire of skills to the novel situation of a case.[9]

Since both problems and solutions are ever-changing according to this philosophy, students need the ability to appreciate alternative solutions to problems. To be locked into one solution resulting from one set of logical suppositions is to court blindness and obsolescence in thinking. Thus, cases are designed to be open to divergent solutions.[10]

Finally, the philosophy underlying the case method recognizes that an education geared to develop problem-solvers and designed to develop an appreciation of alternative solutions must actively involve the student. Students cannot passively incorporate others' thoughts. Students must discover principles, not just hear about them in lectures; and they must solve problems, not just read about their solutions.[11]

With these three philosophical tenets in mind, teachers can clearly see how the case method is easily adapted to many current trends in technical communication. It embodies the new emphasis on teaching the process of technical communication. It also requires students to apply their heuristic and invention

techniques as few other tehcnical communication pedagogical techniques can.

Teachers of technical writing in the 1980's are well aware that only a heuristic creative pedagogy will produce students who will be successful in the 1980's and beyond. Thus, the time is right for the case method to regain a place in technical communication pedagogy.

Footnotes

[1] Gordon H. Flammer, "The Case Study: Exercise in Simulation," _Engineering Education_ 68 (February 1977): 372.

[2] David Tedlock, "The Case Approach to Composition," _College Composition and Communication_, forthcoming, p. 9. See also Robert Hays, "Case Problems Improve Tech Writing Courses and Seminars," _Journal of Technical Writing and Communication_ 6 (1976): 296.

[3] The composition theoreticians giving considerable attention to the effects of an incomplete rhetorical context on students include: Richard Larson, "Teaching Rhetoric in the High School: Some Proposals," _English Journal_ 55 (1966); James Moffett, _Teaching the Universe of Discourse,_ (Boston: Houghton Mifflin, 1968), p. 12; Frank D'Angelo, _Process and Thought in Composition_ (Boston: Winthrop, 1977), p. 23; John Warnock, "New Rhetoric and the Grammar of Pedagogy," _Freshman English News 5_ (1976): 15; and Linda Flower and John R. Hayes, "The Cognition of Discovery: Defining a Rhetorical Problem," _College Composition and Communication_ 31 (February 1980): 25

[4] Wayne C. Booth, "The Rhetorical Stance," _College Composition and Communication_ 14 (October 1963): 139.

[5] For an example of this problem, look at the assignments in Mary C. Bromage's _Cases in Written Communication_ (Ann Arbor: University of Michigan, Bureau of Business Research, 1964).

[6] Ben E. Barton and Marthalee Barton, "Bridging the Gap Between Student and Engineering Professional: The Case Method in a Technical-Communication Course," paper presented at a College Composition and Communication conference in Minneapolis, Minnesota, April 1979: 3-4, p. 13.

[7] Robert H. Weiss and John P. Field, "Cases for Composition: A Theoretical Model for Writing Instruction," (Bethesda, Md.: ERIC Document Reproduction Service, ED172194, 1979): 15.

[8] Walter Ong in his article, "The Audience Is Always a Fiction," _Proceedings of the Modern Language Association_ 90 (1975): 5-12, suggests that all writers' audiences are implied or fictive.

[9] Arthur Stone Dewing, "An Introduction to the Use of Cases," _The Case Method of Instruction, A Related Series of Articles_ edited by Cecil E. Fraser (New York: McGraw-Hill 1931), p. 13. See also Charles F. Fisher, "Being There Vicariously by Case Studies," _In On College Teaching_ edited by Ohmer Milton (San Francisco: Jossey-Bass Publishers, 1978), p. 260.

[10]Dwight Little, "The Case: Milieu and Method," Journal of Business Communication 8 (Summer 1971): 31-32.

[11]Wallace B. Donham, "Business Teaching by the Case Method," The Case Method of Instruction, A Related Series of Articles edited by Cecil E. Fraser (New York: McGraw-Hill, 1931), p. 16.

7

Case Method Annotated Bibliography

Technical communication fledgling use of the case method necessitates that one examine not only t.e published work done in technical communication's l : also the continuing published work done on the case method in three other disciplines--engineering, business communication , and general composition.

Thus this bibliography is not only divided into analytical articles and casebooks, but also into materials drawn from engineering, business communications, general composition, and technical communication.

From Engineering

Analytical Articles

Flammer, Gordon H. "The Case Study: Exercise in Simulation." Engineering Education 68 (February 1977): 372-373.

This article reviews the use of cases and simulation games to bridge the gap between the classroom and the workplace. It also examines various elements of each technique along with suggestions to teachers on how to implement them in the classroom.

Fuchs, Henry O. "Outside Reality Inside the Classroom." Engineering Education 61 (March 1970): 745-747.

This article discusses how cases can bring outside reality to the classroom. It examines the use and effects of cases on learning.

Kardos, Gordon. "Pointers on Using Engineering Cases in Class." Engineering Education 69 (January 1978): 347-349.

This article specifically discusses how engineering teachers can use cases in the classroom. It analyzes the instructor's role, the methods of case discussion leadership, the physical arrangement of the classroom, and teaching preparation.

Vesper, Karl H. "Teaching Objectives, Style and Effect with the Case Method." Engineering Education 62 (April 1971): 831-835.

This article describes some initial attempts to evaluate learning from the case method in engineering. Preliminary data based on student evaluations show the case method to be an effective teaching technique.

_____. "Measuring Change Produced by Case Method Instruction." Engineering Education 63 (October 1972): 37-40.

This article describes two experiments using formal evaluation techniques with students who have been taught via the case method. Neither of these evaluation techniques effectively demonstrated that case method instruction changed students measurably.

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_____. "An Easier Way To Teach With Engineering Cases."
Engineering Education 69 (January 1978): 349-351.

This article points out an easier way to use cases in the engineering classroom allowing a team of students to lead the discussion of the case and to filed class questions. This method is contrasted to the teacher-centered guidance of group discussions, teacher-centered lectures on the case, and total non-guidance of the case discussion.

_____ and Adams, John L. "Evaluating Learning From The Case Method."
Engineering Education 70 (October 1979): 104-106.

This article analyzes how various teaching styles and techniques affect the efficacy of the case method.

Casebooks

Fuchs, Henry O. and Steidel, Robert H. Ten Cases in Engineering Design.
(London: Longman, 1973).

This collection of ten cases puts the engineering student in the position of the professional engineer, confronts the student with incidents drawn from actual practice, and gives him an opportunity to review decisions made in the case situation as well as the outcome of the case.

From Business Communication

Analytic Articles

Brown, Leland. "Collecting Data, Preparing and Publishing a Case."
American Business Writers Association Bulletin 5 (December 1964): 25-29.

This article describes some salient features of good cases, how they should fit the classroom situation, and how they should require students to perform a variety of tasks. This article goes on to discuss sources of case information and how the information can be collected, written, and published.

Cochran, Daniel S. and Gibson, C. Kendrick. "Putting a Square Peg into a Round Hole: Communication Models and their Application."
Journal of Business Communication 17 (Fall 1979): 27-36.

This article makes the point that only a teaching package consisting of an integrative communication model, a systems theory, and the case method can really prepare students to communicate effectively in the work environment.

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Kaye, Norman J. "The Contribution of the Case to Learning, Teaching, and
    Professional Advancement." American Business Writers Association
    Bulletin 3 (December 1964): 21-24.

This article discusses the varied uses of cases in business
communication pedagogy: its use for teaching within the framework of
"inquiry training," and its use for teaching in directive or nondirective
ways.

Little, Dwight. "The Case: Milieu and Method." Journal of Business
    Communication 8 (Summer 1971): 29-36.

This article discusses the genesis of the case method in law and
medicine, the features of a typical business case, how cases are solved,
how to "look" at a case, and sources of case materials.

Robbins, Jan C. "Training the Professional Communicator: The Case Study
    Method." Journal of Business Communication 12 (Spring 1975): 37-45.

This article decries the fact that academic communication programs
can educate students only up to the level of novice, or, at most, craftsman.
The expert level of competence, however, is rarely attainable with the
current workshop and lecture methods of instruction. This article advocates
the use of the case method to advance students to the level of expert
communicators.

Swenson, Dan H. "Case Method in Business Writing." In Nineteen
    Selected Presentations of the 44th National and 5th International
    ABCA Convention, 1979. Champaign, Illinois: American
    Business Communication Association, 1979: 191-199.

This article discusses the advantages of using cases in teaching
business communications. It goes on to describe the differences between
structured and unstructured cases according to their purposes and goals.

Weeks, Francis W. "How to Write Problems." In The Teaching of Business
    Communication. Champaign, Illinois, 1978: 223-229.

This article discusses the sources of cases, what makes a case
effective, and common shortcomings of cases.

Casebooks

American Business Communication Association.
    Business Communications Casebook One (1970)
    Business Communications Casebook Two (1976)
    Business Communications Casebook Three (1980)
    Champaign, Illinois: American Business Communication
    Association.

These three casebooks are designed to elicit a variety of student business communication assignments: letters, memos, and reports. The cases range from five-line cases to sixteen-page cases. The newest edition includes two new sections, letters to be rewritten and large-scale organizational communication problems.

Bromage, Mary C. Cases in Communication (1964), and Nelson, Bruce A.
     Cases in Comm ication II (1967) Ann Arbor, Michigan: University
     of Michigan Lureau of Business Research.

These two casebooks have selected business situations chosen for the part played, for better or worse, by written communication or the lack of them. These casebooks include a discussion of how to use the case method in the classroom and twelve cases. The presentation of each case begins with a discussion of a specific technique, e.g., "using the prepared form." Then the case is given in order to reinforce the point with students.

Brown, James. Cases in Business Communication. Belmont, California:
     Wadsworth Publishing Company, 1962.

This casebook includes eight rather involved business cases which elicit a wide variety of business communication assignments. The cases are self-enclosed and include extensive assignment lists.

Parkhurst, Charles C. Case Studies and Problems in Business Communications.
     Englewood Cliffs: Prentice-Hall, 1960.

This casebook includes fifty short, simulated business situations to elicit letters, memos, and reports from student writers.

Weeks, Francis W. and Hatch, Robert A. Business Writing Cases and Problems. Champaign, Illinois: Stipes Publishing Company, 1972 and 1977.

This book with its two editions has eighty-nine short case problems. It arranges them by theoretically separate issues: informing, persuading, negative-message writing, job applications, and managing communication systems. This book also includes appendices on business letter mechanics and punctuation, and an introduction which briefs students on the case method.

From General Composition

Analytical Articles

Jarvis, Paul. "Teaching Problem-Solving." Paper presented at College
     Composition and Communication conference, Washington, D.C., April 1980.

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This article explains how the case method is the best opportunity to teach what is presently known about writing as a process. Specifically, the case method makes writing seem real; it emphasizes pr blem-solving; and it provides students with a clear sense of audience. The article goes on to answer some of the practical and theoretical objections to the case method. The article ends with a five-page sample case.

Weiss, Robert H. "Assignments that Succeed: A Case Approach To Composition." Bethesda, Md.: ERIC Document Reporduction Service, ED161060, 1978.

This article explains how the case approach to compo;ition is a successful alternative to the traditional pattern of instruction in which little attention is paid to the writing assignments given to students. Weiss explains how the case approach is based on considerations regarding students' writing interests and fears, the effects of writing for different audiences, and elements of the writing process.

_____ and Field, John P. "Cases For Composition: A Theoretical Model For Writing Instruction." Bethesda, Md.: ERIC Document Reproduction Service, ED172194, 1979.

This article advocates the use of the case method approach to composition by noting that cases can best be used to engender writing. The article goes on to suggest how teachers can implement the case method in their individual classrooms. It concludes by describing three sample cases.

Casebooks

Jarvis, Paul and Tedlock, David. Casebook Rhetoric: A Problem-Solving Approach to Composition. New York: Holt, Rinehart and Winston, forthcoming.

Weiss, Robert H. and Field, John P. Casebook for Composition. Boston: Little Brown and Company 1979.

This casebook contains some self-contained cases in which all information is available and some open cases calling for some type of research. These cases call for reports, speeches, summaries, condensations, biographies, and letters--all with an obvious purpose in their particular case context. The cases cover a wide range of rhetorical problems from a wide range of disciplines.

From Technical Communication

Analytic Articles

Barton, Ben F. and Barton, Marthalee S. "Bridging The Gap Between Student and Engineering Professional: The Case Method in a Technical Communications Course." A Paper presented at the College Composition and Communication Conference, Minneapolis, Minnesota, April 1979.

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This article discusses the use of the case method in technical communication. It explains how the method helps students to analyze open-ended problems, to adapt their communications to varied audiences' needs, and to practice team report writing.

Hays, Robert. "Case Problems Improve Tech Writing Courses and Seminars."
    Journal of Technical Writing and Communication 6 (1976): 293-298.

This article explains the usefulness of case problems, suggests ways and criteria for their preparation, and offers a brief example of a case.

Jobst, John. "Problem-Solving Techniques in Technical Writing." In
    Proceedings of the 27th International Technical Communication
    Conference. (n.p.: Society for Technical Communication, 1980),
    p. R-51-R-55.

This article presents several problem-solving teaching techniques, among them the case method. The author believes that these methods force students to generate their own ideas on solving communication problems and lead to the acquisition of the principles involved in the writing process.

Mascolini, Marcia and Freeman, Caryl P. "The Case for Cases." The
    Technical Writing Teacher 7 (Spring 1980): 125-6.

This article describes how teachers at Western Michigan University are using cases in Freshman English to turn it into an introductory course in business writing. Cases allow freshman to practice the kind of writing and thinking they will do in their careers. The article goes on to describe the advantages of using cases in Freshman English.

Skarzenski, Donald. "A Problem-Solving Case For Technical Writing Courses."
    The Technical Writing Teacher 5 (Spring 1978): 97-98.

This article presents a sample memo problem case and describes how it can be specifically used in a class.

Casebook

Brown, James. Casebook for Technical Writers. Belmont, California:
    Wadsworth Publishing Company, 1961.

This book contains fourteen self-contained cases calling for students to produce feature stories, instructions, letters, reports, speeches, proposals, abstracts, book reviews, manuals, memos, progress reports, telegrams and eight different types of graphic presentations. The cases demand a variety of student backgrounds ranging from a general background to a background in basic electronics and chemistry, to a background in advanced chemistry and mathematics. Each case is presented in sufficient, narrative detail to offer a full rhetorical context to students.

"How To Develop and Write a Case for Technical Writing"

Barbara Couture and Jone Goldstein

Wayne State University, Detroit

Over the past few years, we have written cases of different sizes and shapes for teaching technical writing to engineers at Wayne State University. Originally, we adopted the case approach for some assignments because our sophomores and juniors lacked technical expertise and professional knowledge of the engineering world. Classroom experience soon proved to us that cases could indeed make up for students' lack of information and professional awareness. We also found out that cases were good exercises even for advanced students, providing realistic practice in specific writing tasks or isolating particular skills in the composing process.

In writing and testing various types of technical writing cases, however, we gradually developed a special kind of case which narrates the experiences of one technical person engaged in the problem-solving process in a professional rhetorical situation.[1] Told from the limited point of view of this professional who writes as part of his or her job, the tale--replete with realistic technical data and contextual information--follows him as he confronts the communication problems which are an integral part of his technical task, recounting events without definitive assignments or evident communication solutions. These answers then must be created by the student who assumes the persona of the professional and writes whatever documents are appropriate.

We call this long, realistic fiction a "holistic" case. Rather than presenting technical information in a slight rhetorical frame, rather than isolating skills or tasks, rather than dictating exercises for which there is a known solution, rather than asking students to role-play a character, a holistic case realistically encompasses the whole of the technical writing process. A holistic case allows students to experience the total communication act in which the technical task and data are fully i. grated into the rhetorical situation. A holistic case gives students the opportunity to perform in a realistic context, using all of the skills and knowledge required in communication on the job. Despite the fact that other kinds of cases have a valid place in technical writing courses, we believe that the holistic case most fully exploits the advantages of the case method for students of professional communication.

The salient components of a holistic case are the persona of the technical professional, the facts about the technical problem and the real company, the fiction created on the basis of those facts, and the form of the case itself adapted for students.

The persona that the student must adopt furnishes the entry point into the case, a professional role in the situation, but not a personal identity or

character--rather a way for each student to "live" the case by assimilating his
or her individuality to the professional mask. The origin for any valid case,
however, lies in its facts, the base of real information about real people with
real technical problems and real writing tasks in real organizations. The
numbers must fit, the data must correlate as well as a technical report with
the real world. The case must go beyond, or behind, this information, however,
to recreate the facts into a whole, into a fiction which enables the student
leader to "believe" and thus to experience the complexity of the real world of
work in process. Finally, the form of the case must furnish a suitable vehicle
for students to learn communication principles and skills, and to become
engaged in the whole of the writing process, creating individual solutions in
the form of professional documents--memos, letters, reports, proposals.

These components of a holistic case presuppose the process for developing
it. The would-be case writer, however, should be aware of the procedures
necessary to produce a case that meets this description, and so we are outlin-
ing here a set of guidelines for instructors who wish to write holistic cases
in technical communication.[3] The four major steps relate directly to develop-
ing the noted components, the persona, facts, fiction, and case form. These
stages are:

First -- Design the case: Plan the goals and objectives for the
students who will assume the persona, and establish the real-world source
of information.

Second -- Collect the facts: Conduct the interviews, and research
the technical and rhetorical information about a specific problem in a
real organization.

Third -- Create the fiction: Transform the facts into a realistic
fiction which could have happened to a technical professional on the job.

Fourth -- Construct the case: Recast the fiction into a functional
instrument for students to write professional documents.

In the design and construction stages, the writer must aim to turn the
materials into a document that will work in technical communication courses.
However, the collection and creation stages are of chief significance; in them
the writer must connect the case to real events that actually occurred inside
some firm, and then write a believable narrative representing what might have
happened on the basis of those facts. As the Harvard casewriters in business
administration have insisted, cases must be built on thoroughly investigated,
real situations; "armchair" cases, concocted from general principles, a patch-
work of anecdotes, and the casewriter's practical experiences from here and
there, are academic monstrosities that only purport to be real.[4] After
finding the facts, however, the writer must shift his efforts to fabricating a
story. A communication case cannot be written without empirical
data; it cannot be constructed on facts alone in the mode of the business
or engineering case. A "facts-only" case, like an armchair model, is distor-
ted, but for a different reason: it lacks the heart of the rhetorical matter--
the people problems, the messiness of interaction, the political dimension.

The process of collecting data and creating a story is a real dialectical interaction of fact and fiction. The fact about the real problem originates the fictional image which, in turn, must be validated in terms of the real-world's possibilities. In short, the case must be realistic, not necessarily real in every detail; the fiction must be plausible, for no matter ho real and true, without seeming to be so, the case will not be accepted as representing professional experience by its readers.[5] In developing a case, therefore, the casewriter must go back and forth between the story, the data base, and its source, the interviewees. The casewriter thus works backward from the finished product (say, a final written report) to recover the developmental process and environment. Even during the collection stage, he must reach beyond the written documents and technical data to recover the "stuff" of human relation-ships behind the project. Out of these fragments of reality, then, the case-writer creates a fiction, a whole and credible experience that might generate the actual documents produced. The student, reading the case, reverses these procedures, developing written products by re-enacting the process.

Stage 1 - DESIGNING THE CASE

The objective of the first stage is to plan the case objectives and proce-dures in light of the target students and a real-world contact person. Basic principles of effective case design, as outlined by John Brockmann,[6] should govern all stages of the procedures for holistic cases. However, even in the initial preparation, the development of a holistic case differs from cases focusing on the facts or aiming for specific tasks or skills (writing a pro-gress report or a report with a comparison section). Instead of identifying specific objectives for the writing to be produced from the case, you should adopt the development of general principles, strategies, and skills of techni-cal communication as your goals. A holistic case will present a real communi-cation situation involving writers in basic rhetorical principles such as report design based on audience analysis, in planning strategies such as selec-tion of relevant information from masses of detail, and in skills such as revision for reader efficiency. Thus, rather than designing the case with specific assignments in mind ("a trip report in memo format"), you should follow the lead of the empirical evidence, giving full play to the complexities di overed.[7] In fact, throughout the procedures you should question your methods and your manuscript to ensure that you are not adjusting the facts to meet academic preconceptions either about the target students or your pro-fessional contacts.

1.1 Define the target students by their career goals, their current status, and their potential use of the case in the classroom.

Although the range of students who can profitably use a case extends well beyond a particular occupation, students have the strongest moti-vation and educational experience in cases where the persona of the technical profession closely defines their own career goals. The profession, the occupational setting, the employee position, and the writing tasks of the persona should all be at least reasonable and relatively imminent for the student audience.

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Although the facts in the real world are primary, the case must present technical information within the students' capabilities, must assume only pr fessional expertise within their knowledge, and must demand reading and writing tasks within their competency.

Although the situation should display the principles inherent within it, the potential classroom application cannot be ignored as a factor in many decisions; without some control, many ca.es would grow like topsy until they could never be used without major surgery.

1.2 Select the real-world contact by the organization and by the technical professional as writer.

Select an organization of type, size, and activity pertinent to the profile of the target students. Consider, however, the accessibility you have to that organization through an appropriate emplo.e witnin it--someone who meets your criteria for profession, technical field, position, and writing tasks. Although you ma. .ed supplementary or "sponsoring" contacts within the company who have suffi ie. . authority to provide access to documents, to prese.r the supervisory or institutional perspective, or to furnish entree to other offices or units, your most essentia. contact is the technical professional who must write as part of his or her position, within the company ranks.

Although a management sponsor could assign a writer to work with you on the case project, you will do best to work through your personal acquaintances or contacts developed during the course of consulting or other business-industrial activities. The personal approach is advisable because the resource writer must be willing, even eager, to participate in the case development. Not only must he devote many hours in interviewing time (far more than most firms would low on the job), but he must be open, revealing much about his firm and his co-workers--and himself. The resource professional must become your true partner in the educational enterprise. The overriding pre-condition for collecting the data for a good holistic case, therefore, is to find such a trong contact person.

Stage 2 - COLLECTING THE FACTS

The objective of the collection stage is to reconstruct a subjective view of a complete communication event by amassing technical and rhetorical details. Your interviews of the technical professional, the main method for collecting this information, should be a sequence of meetings which facilitate his responses, gradually allowing you to s.are his world. These i.terviews have three functional stages: to introduce the case project, to research the technical facts and rhetorical record, and to explore the rhetorical situation in depth.

In all your interviews, aim to get the respondent to talk freely and open ly about the subject by using techniques of exploratory interviewing. (Tape-recording will help here by allowing you to be an undistracted, encouraging listener.) Let the flow of interaction, subtly guided by your open-ended questions, govern the meetings. Seek all documents generated by the project

and then use the writing as a probe in subsequent discussion. Eventually, pose some closed questions and request that the respondent elaborate upon and verify your record. Overall, however. let the exploratory approach prevail and thus ensure a case built upon real happenings, not academic preconceptions.

2.1 Introduce the case project. Prerequisite for the success of the interviewing are the initial meetings in wnich you engage the technical professional in the project, pledge anonymity to him, and select the communication problem for the project.

Engage the respondent. While establishing rapport with your respondent through receptive interviewing about his work, you can learn much about the routine of his position, unit, communication, and the company--background material that will bear upon the case. Most people like to talk about their jobs; if you show genuine, uncritical interest, you will encourage the flow of information and probably get to look at samples of the writer's memos, letters, and reports. In these initial encounters, you should also explain your methods for researching the case and your educational objectives, particularly how students will use the finished case. Otherwise, some respondents, especially those familiar with business administration or engineering cases, might approach your project with serious misconceptions.

Pledge anonymity. Of chief importance in the first sessions is to state your ethics as a casewriter and your responsibilities to the respondent and his firm. You should pledge anonymity to the contact, both within and without the company; you should promise protection of institutional identity and proprietary information; and you should outline your proposed distribution of the case and methods for disguising information. You can gain the technical person's confidence by promising to submit the case manuscript for his approval; if necessary, you can relieve him of any burden for proprietary information by clearing the facts with the organizational sponsor. Throughout the case project you should carefully maintain the anonymity of the firm, its products, and its personnel, leaving nothing in the case manuscript that could be traced back to its source and never referring orally to your contacts by name or firm. Such care is necessary to protect yourself, as well as your sources. Contrary to the business case which is facts, the holistic communication case deals with subjective impressions and dramatic representations of probable actions. Securing formal company releases for such information would not only be extremely difficult, but the shadow of the request for such permission could kill the case before it is born. Few individual writers would provide the kind of information you need if management were scheduled to peruse the case prior to its release; in fact, even the possibility of such inspection could undermine the trust and confidence necessary for interviewing.

Select the communication problem. After you establish the cooperative structure and the procedures of the case project, you should ask to screen the technical professional's communication for material appropriate for the case. Encourage him to elaborate on the circumstances of a document, so you can uncover possibilities, as well as acquaint him with the holistic case approach. Criteria for selecting a project include the governing objectives and principles (for example, is the matter routine?), as well as

pragmatic considerations (does the material lend itself to various solutions; does it have some focus and shape as a distinct event?). Obviously, you should avoid projects the respondent cannot remember well or which did not fully engage him. Your screening should also eliminate problems that are technically inappropriate for any of several reasons, but chiefly because they are highly sensitive subjects from the firm's perspective. On the one hand, technical information must be up to date so that students will view it as current; on the other hand, it must not be so top secret that your contacts will fear to discuss it openly. Corporate protection of technical information is a fact of business which you must take into account--better to drop the highly proprietary project at the first negative sign than to scrap it after a big investment of time.

2.2 Research the technical facts and the rhetorical record. The second set of interviews should build up a picture of all the facts on the selected project, but particularly the technical facts. The technical problem, the steps in the technical problem solving, the data obtained, the solutions-- all aspects of what the technical professional perceives as his "real job"-- should be covered in great detail, far beyond what seems relevant to writing a case, much less alone writing a report. Moreover, you should seek your respondent's help in whatever analysis and interpretation you require to adequately understand the technical information.

Beginning with the technical problem solving is a strategy for success as a holistic case researcher. The technical focus convinces your respondent that the project is a serious education activity for his profession, one worthy of his efforts. It will also fully establish your working relationship. Part of his trust and willingness to go forward from this point, to try deeper waters, stems from his recognition that you grasp his technical problem and understand what he is doing. At the same time, his role as your teacher is well defined because you have focused on the technical subject; your subsequent efforts to learn about his rhetorical situation will not be thwarted by his desires to tell the English professor what he or she wants to hear.

As soon as the survey of the technical information is well in hand, you should begin to collect the facts about the rhetorical situation, the organizational record and official memory of the evolution of a problem or a project: who assigned the task to whom, and so on. Even at this level, you may be struck by how much the respondent cannot remember or never knew. Try to trigger his memory with provocative questions, or simply by chatting about the topic, encouraging him to recollect. If the gaps disclose a substantial amount of important material the contact never did know, try to locate other persons within the company who can furnish the missing pieces. Keep in mind, however, what omissions characterized your primary contact's view; these gaps will become important as you create the fiction.

2.3 Explore the rhetorical situation in depth. The third set of interviews aims to go behind the official record to discover what actually happened, why it happened, and how it happened. Although these exploratory meetings should not be confused with therapy sessions, they are similar in one objective: to encourage the respondent to delve into his memory to

recover the experience as fully as possible, including what was never acknow-
ledged nor intended to be retrieved.

On the simplest level, you should try to reconstruct the techni-
cal events and the problem-solving process, including its rhetorical component,
as it really happened, rather than in the "official version." At the point of
writing up any investigation, reality undergoes a filtering and reordering to
fit the constraints of the document; the dead ends and detours are often buried
in a lab or log book; the finished paper or report which ignores the circuitous
route becomes history—the truth. The case writer must write a new record full
of the jumbled omissions and misunderstandings as well as facts and know-
ledge. To achieve this end, your main task is to alleviate the contact's
embarrassment, even anxiety, in tearing down the neat image invoked by the
written product so he will be committed to recovering the flux of life which it
ordered and shaped.

In-depth interviews should also try to recover information the
respondent probably views as extraneous: the interaction impinging on the
writing (the discussion at the coffee machine and the confrontation over the
telephone). This is information which a typical technical professional be-
lieves to be separate from the task and its completion. Since he considers
it to be at best irrelevant and at worst an obstruction, usually he has
suppressed his memory of it; with little recognition of its significance to
the reality of the problem-solving process in action, he will only respond
appropriately if you guide him back over the territory, with many "and then
what happened" questions.

Beyond recovering the actual behavior of participants in the
events, you should also evoke the writer's impressions of things and his
analysis of motives, his own included. Aiming to elicit his responses, you
can ask him to recount an event in detail, and then ask to explain it or tell
how he felt about it. Another technique is to re-play a tape and then ask him
to interpret and elaborate upon it. The subjective reactions you seek (the
key to portraying the situation fully and from the writer's point of view)
may be difficult to recover, even if the respondent is willing and open; he
may never have consciously confronted what "really was going on," or he may
have simply forgotten the unpleasantness. For most respondents who feel
comfortable with the interviewer, however, eventually the flood-gates will open
with the personal views, what is essentially "my side of the story." These
responses are, of course, akin to informal conversation with its gripes and
gossip, what is usually heard over the bar or in the carpool, remarks which
are self revelatory but not therapy.

Stage 3 - CREATING THE FICTION

The objective of the third stage is to transform the record of real-world
facts into a fiction through which the student can experience the full com-
munication process on the job.

Though you began with information about the real technical problems at a
real firm, you cannot write up this data into a case. No matter how focused

your information collection on the specific problem, other problems and tasks impinge upon it, denying it a tidy shape and a satisfactory ending. No matter how in depth the transcripts of your tapes or full your details on the other employees, you do not know most of these people nor the full reasons for their acts; they remain shadowy figures in your imagination. Obviously, then you must take all these facts and impressions and create out of them a fiction, a story with close correlation to the "hard facts" of the technical data and the organizational procedures, but with primary fidelity in all other respects to the sense of reality in the story, to the truth of its fictional world in which the reader must place his belief. Thus, for example, you must invent the dialogue for not only the persona of the technical professional, but for all the other employees as well, fashioning words that could have been said-- telling a tale.

Techniques of the storyteller that can transform the facts and impressions into a narrative are as various as the art of fiction. Certain strategies, however, are essential to produce a realistic fiction capable of interesting and engaging student readers, while readily lending itself to adaptation into a functional case. These are creating a persona which restricts the point of view to the writers and offers the reader a way into the fiction; developing well-realized characters in a realistic setting; planning a plot which traces the writer's experience of trying to solve a problem; and modeling language on the discourse types through which the writer gains access to the information.

3.1 Create a persona which restricts the point of view to the technical professional and pulls the reader into the fictional world. You should write a story which strictly defines the persona's view on this world, limiting the fiction to his direct experience of and response to people, events, and information. The image of this technical professional must be one with which the students can identify because of the relevance of the occupation and of the demonstrated professional competence. If readers are to project themselves into the mask of the technical professional, however, you must devise the persona to minimize the distance between the image and the reader. Most obvi- ously you should limit the explicit characteristics of the professional person. Do not provide a name, assign a sexual or ethnic identity, suggest anything about a private life, nor mark any strong personality traits, especially not quirks or incompetencies. The objective thus is to create a persona that invites the reader not to role-play a character but to assimilate his or her individuality into the professional mask. Such a persona is a vehicle through which the reader can experience the real-world of work and develop his or her own genuine professional voice.

3.2 Develop well-realized characters in a specified setting. Con- trary to the persona's neutrality as a character, the surrounding employees in this technical narrative should be fully developed characters portrayed in a rich accumulation of mundane detail. From your factual record, select the ele- ments and then fabricate the missing pieces to complete a coherent picture of real but fully disguised persons operating in what seems to be a faithful re- production of a real organization. Overloading the details, you should empha- size the relevant points to create whole characters whose behavior is believa- ble, whose actions exhibit their significant traits, and whose total charac-

teristics add up to coherent if one-sided professionals. Individual actions should be invented to demonstrate motivations, and personal speech rhythms must be established, along with behavioral motifs. These features will allow you to compress as much personality as possible into limited narrative time. Your aim is to create a fiction that "shows" more than it "tells" so that the reader will be involved directly with the persons in action in a solidly specified world and forced to analyze the whole situation for himself.

3.3 Plan a plot that traces the writer's experience of trying to solve a problem. Because real projects don't have tidy beginnings and endings, you must define and shape certain events to represent in the fiction. Also, most real projects absorb only a part of an employee's day; your story must clearly represent that fact without overburdening the reader. A real project may have three aspects, two of which you might eliminate; it may have two phases separated by years, which you might collapse into a single time frame; it may have unsupportable complexities, which you might suppress to a couple of salient issues. Your factual records, in short, should be modified to develop a plot structure which will help you to tell a realistic but captivating story, involving the reader in what will happen next and encouraging him to seek answers for the dilemmas confronted by the persona.

The plot of this fiction should be built upon the individual technical professional's active involvement in the problem-solving process, both in its technical and rhetorical aspects. The ordering of the action, then, should be determined by the chronological pattern of the persona's growth to knowledge, not by when an event occurred. In the real world, the technical professional must cope with whatever he knows at the moment; thus a case plot should not "organize" data but feed information to the reader in the order it would come naturally to an employee on the job. Although much of the information, particularly the technical data, should be presented descriptively to condense the story, significant communication actions like interviews and meetings should be dramatized in part, both to heighten reader interest and to cause him to deal with the interaction directly. Thus, the plot line must reinforce the reader's understanding of the problem as in a state of becoming through presenting information that is full of gaps, repetitions, contradictions, and always subject to new interpretation.

3.4. Draft the fiction simulating the types of communication in which the writer originally got the information. The story should be drafted in forms most closely approximating the modes of discourse actually used in the real situation. Some transmission may be in the form of documents--a memo assigning the problem, for example. You can either use real documents (disguising them appropriately), or you can draft them, closely imitating models you observed. Most of the language of the fiction, however, should be in conversational discourse, some in narrative form, but much in dialogue. In other words, the fiction should be written in forms totally unrelated to the documents that the case should generate. (This principle is particularly important for technical data which should not be ordered into patterns beyond the log or lab book.)

Using your interviewing tapes, try to capture the oral language of the particular work place, toning down the jargon as necessary to make it easily intelligible and to avoid caricaturing the technical persons. Write much of the fiction in the "internal" language of the persona, so that he can explain for himself what he is doing, what he is finding out, and how he responds to the situation. The style of these "mutterings" should not attempt to represent any modified stream of consciousness, but rather should represent an internal monologue, readily understandable to the world outside the self.

Stage 4 - CONSTRUCTING THE CASE

The objective of the case construction stage is to adapt the fiction into a functional instrument for students to use in writing professional documents. There are five main steps: revising the fiction so that the communication solutions remain open questions for the individual student; adapting it so that it focuses clearly on the communication process; screening the information according to students' backgrounds; adapting the information to functional use; and formatting and validating the case for the classroom.

4.1 Revise the fiction so that the communication solutions are left open to the individual student. In the real world, there is no one correct response, no one defined solution, but rather a range of possibilities of greater or lesser effectiveness in solving a communication problem. Moreover, these options are not equally pertinent to all writers. The student thus should have the burden of creating the communication answer that is both appropriate for the facts, but also for the synthesis of the persona and his or her individual self. If this truly open situation is to prevail, however, you must revise the fiction to ensure that you have not "loaded the dice" for a specific response or been unduly influenced by the actual documents produced by the technical professional you interviewed.

4.2 Adapt the fiction to focus on the communication process. The process of resolving communication problems introduced in a technical fiction can be very time consuming, but crucial to developing student skills in assessing the context for writing. Time students spend reading, researching, analyzing technical problems, however, is time not available for their communication learning. Although data should not be recast into non-narrative forms (as it might be presented in an actual report), you should reduce the student reading and analysis time as much as possible without destroying the rhetorical impact of the case. Most rhetorical information should be of some potential relevancy in defining the audience and purpose of the communication; the details for background or providing overload should be reduced to a reasonable amount commensurate with the goals of selecting the relevant from the mass. More important, the technical information should be analyzed within the case, usually in the internal monologues of the persona and the dialogues with peers. The point is that the students' major efforts should be devoted to confronting the composing process as an integral part of the technical task, and to confronting the whole of that process, not merely the drafting of an assigned piece. They should have to begin at the beginning by defining what is truly their own problem, analyzing their audience, figuring out their purpose, so that they can set about producing the documents that will meet their ends.

4.3 Screen the information in the story according to the needs of the students. Judging the target populations' technical and professional expertise, you should screen all the technical information, professional activities, and organizational methods to determine where the students will need explanations or elaborations to use the case with ease. Asking representative students to read the manuscript and noting their difficulties will facilitate your task here. To avoid destroying the verisimilitude of the case, identify all information the students need which is inappropriate for the persona to think or talk about (for example, defining a term common to an industry but little known elsewhere) and place these items in the case apparatus: a background statement, footnotes, and appendices.

4.4 Screen the fiction for its functional application to writing. In reconstructing the process through which the technical professional solved his problems and wrote his documents, you may have inadvertently left out critical pieces of information, failed to emphasize certain points, or unintentionally contradicted messages. You may have insufficiently disguised some information or confused the picture through your efforts to disguise it. By attempting to write the possible documents based on the case yourself, and by subsequently assigning them to representative students, you can determine if the information base in the case has integrity and is applicable to producing writing. The critical questions to answer here are: Is there anything that a real writer would know in this situation that is not made apparent for the student? Is there any problem with the case information that is caused by the inadequacy of the case rather than by its attempt to mirror the imperfect real world?

4.5 Format the case and validate it for classroom use. Once you have completed the case manuscript, you should divide and format it into units that can be used easily by students in reading and writing up the information. You should prepare a possible list of assignments that could grow out of these materials, and you should validate these tasks by classroom use, preferably under other instructors. (Can they teach communication skills with this case without getting caught up in problems inherent in the case itself? Does the case facilitate their job?) Finally, you should submit the case to your technical partner for validation of authenticity. After all the adjustments, you must feel satisfied that every piece fits, every identity is sufficiently disguised, and the story "tells it like it is" on the job.

Passing your resource person's review determines that your case is true. However, the final hurdle is the target student audience's acceptance of the case as both real and relevant. We believe that one of our student's anonymous comments attests to this strength in a holistic case. She wrote: "The case gives you a real feeling of what it will be like when you are out on a job and you have to write a report."

NOTES

1.   We have been influenced by reading business administration, business communi-
cation, and engineering cases, and by numerous discussions of the case method
by educators in all of these fields, and now also in general composition.   For
example, see Andrew ι. Towl, To Study Administration by Cases. Boston: Harvard
University, 1969; Malcolm P. McNair, ed. The Case Method at the Harvard Business
School. New York: McGraw-Hill Book Company, 1954; Dwight Little, "The Case:
Milieu and Method," Journal of Business Communication, No. 8 (1971), 29-35;
Karl H. Vesper, Engineers at Work: A Casebook. Boston: Houghton Mifflin, 1975;
Robert H. Weiss and John P. Field, "Cases for Composition: A Theoretical Model
for Writing Instruction" (ERIC ED 172 194); and David Tedlock, "Confessions of
a Textbook Writer," College English, 42, No. 2 (1980), 167-70.

2.   For samples of cases demonstrating some of these various characteristics see
James Brown, Casebook for Technical Writing. Belmont, CA: Wadsworth Publishing
Co., 1961; Howard Schultz and Robert G. Webster, Technical Report Writing.
New York: David McKay Company, Inc., 1962; Ron Blicq, Technically-Write! 2nd
ed. Englewood Cliffs, NY: Prentice-Hall, Inc., 1981; Peter Coleman and Ken
Brambleby, The Technologist as Writer. New York: McGraw-Hill Book Company, 1971;
Francis W. Weeks and Kitty O. Locker, Business Writing Cases and Problems.
Champaign, IL: Stipes Publishing Company, 1980.

3.   Guidelines for writing communication cases are very minimal. See Francis W.
Weeks, "How to Write Problems," in The Teaching of Business Communication. Ed.
George H. Douglas. Champaign: American Business Communication Association, 1978.

4.   James W. Culliton, "Writing Business Cases," in McNair, p. 268.

5.   Numerous writers on the case method have discussed this issue. See for
example, Robert Hays, "Case Problems Improve Tech Writing Courses and Seminars,"
Journal of Technical Writing and Communication, 6 (1976), 293-298.

6.   R. John Brockmann, "The Case Method and Technical Communications Pedagogy,"
in this publication.

7.   Many case theorists have discussed the int rrelationship of principles with
the empirical evidence;   see John Brockmann (above) and Robert H. Weiss, who
takes the precepts approach to case construction in "Assignments that Succeed:
A Case Approach to Composition," (ERIC ED 161 060), p. 16. Professor McNair of
the Harvard case school defined the problem by noting that a case is, on the
one hand, "not just an example," but also on the other hand, not "a photographic
slice of life" (in Towl, p. 65). The danger we see in arranging material to suit
suit principles is that the case can wind up supporting preconceived notions
rather than what actually happens in the real world. (See Culliton, pp. 259 and
268.) The whole rationale for the case approach, after all, is to get students
to begin with "evidence rather than general principles." (Thomas C. Raymond,
Problems in Business Administration: Analysis by the Case Method. New York:
McGraw-Hill Book Company, 1955, p. 3.

EVALUATING THE EFFECTIVENESS OF

CASE METHOD INSTRUCTION IN TECHNICAL COMMUNICATION

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INTRODUCTION

Believing that evaluation is an integral part of any project and that no project is complete until the evaluation task is accomplished, we wanted to evaluate the effectiveness of the case method as an instructional technique in improving technical writing. Many times biases for or against a particular method of instruction or a rhetorical theory are held without any quantitative basis for support of the theory; more work on evaluating theories systematically must be done, if possible. Thus, the purpose of this paper is to discuss the development of a self-report instrument that attempts to measure changes in attitude toward technical communication and to present the results of the pilot study in which the case method instruction was a factor in the change.

Using the standards for developing a case set forth by Goldstein and Couture, we designed an evaluation instrument to measure the effect of case instruction on student attitude toward technical communication. This self-report instrument is based on a model developed and tested by Daly and Miller (Research in the Teaching of English, 1975), who studied writer attitude and apprehension toward writing. The most important objective of any evaluation is to provide information for improving the program.

INSTRUMENT DEVELOPMENT

The criteria for measuring attitude toward case method instruction were divided into three categories:

1. Rhetorical principles of technical writing, such as audience analysis; rhetorical purpose; problem definition

2. Planning strategies, such as selection; analysis; solutions; organization

3. Drafting skills, such as the ability to communicate in writing and to use data

Then 26 items reflecting these categories were composed into a Likert-type

LIKERT-TYPE SCALE FORMAT FOR ATTITUDE MEASUREMENT

		STRONGLY AGREE	AGREE	UNDECIDED	DISAGREE	STRONGLY DISAGREE
(+) 1.	I enjoy writing reports supported by detailed facts.	5	4	3	2	1
(+) 2.	I like to include quantitative material (numbers and data) in my technical reports.	5	4	3	2	1
(+) 3.	I want to influence the audience's acceptance of my written ideas.	5	4	3	2	1
(-) 4.	The material in this course discouraged me from identifying and defining practical problems.	5	4	3	2	1
(+) 5.	I feel I can communicate technical material in writing.	5	4	3	2	1
(-) 6.	Presenting and selling my ideas in a technical paper makes me nervous.	5	4	3	2	1
(-) 7.	I don't enjoy reading about or recommending alternative solutions to a problem.	5	4	3	2	1
(+) 8.	The material in this course increased my knowledge of how professionals (such as engineers) work and what they write about at work.	5	4	3	2	1
(+) 9.	The material in this course increased my ability to distinguish between fact and opinion.	5	4	3	2	1
(-) 10.	I have a difficult time organizing my ideas in a technical report.	5	4	3	2	1
(-) 11.	What professionals such as engineers do and write about at work is a mystery to me.	5	4	3	2	1
(+) 12.	It is easy for me to include and interpret data in a report.	5	4	3	2	1
(-) 13.	I dislike reporting and interpreting data in writing.	5	4	3	2	1
(+) 14.	The material in this course increased my ability to identify and define practical problems.	5	4	3	2	1
(-) 15.	When I am presented with an overload of material, I have difficulty stating the practical problem.	5	4	3	2	1
(+) 16.	I enjoy reading about a problem and recommending a solution in writing.	5	4	3	2	1
(+) 17.	Organizing my ideas in a report is an easy task for me	5	4	3	2	1
(-) 18.	I am not good at using quantitative material (numbers and data) in my writing.	5	4	3	2	1
(-) 19.	Writing a technical paper is an unpleasant task for me.	5	4	3	2	1
(-) 20.	Discriminating between fact and opinion is a frustrating experience.	5	4	3	2	1
(+) 21.	I enjoy describing a course of action in writing.	5	4	3	2	1
(+) 22.	I enjoy presenting and selling ideas in a technical paper.	5	4	3	2	1
(-) 23.	Meticulous attention to detail in technical writing seems to be a waste of time.	5	4	3	2	1
(-) 24.	Describing a course of action in writing is a frightening experience.	5	4	3	2	1
(+) 25.	Given a large amount of material, I feel confident about identifying and defining a practical problem.	5	4	3	2	1
(-) 26.	Concern for the reader's acceptance of the information in my written reports is a waste of time.	5	4	3	2	1

FIGURE 1 - LIKERT-TYPE SCALE FORMAT FOR ATTITUDE MEASUREMENT

scale format, each with 5 possible responses. The items had a variance of positive and negative statements listed in random order to prevent any biased response and to provide a method for evaluating concurrence. See Figure 1 for the questionnaire.

RESEARCH DESIGN

For this pilot study, we looked at questionnaires distributed to a maximum of 196 students in technical writing classes at two institutions. The students were divided into two groups: Group 1 had the case method instruction; Group 2 had instruction in technical communication other than by the case method. The questionnaire was distributed twice over a period of three weeks toward the end of the semester. The assumption was that both programs would change a student's attitude toward technical communication. The instruction did produce a change, a positive shift in attitude from Time 1 to Time 2, in Group 2 as well as in Group 1, because both groups were receiving instruction. For purposes of this pilot study we decided to look at group attitudes using the mean rather than at individual attitudes. We felt the group measure to be more stable for this pilot study since we had to test the attitudinal instrument also. Table 1 illustrates the positive shift in student response to Item 17: Organizing my ideas in a report is an easy task for me.

Table 1: Positive Shift in Student Response

ITEM 17							
GROUP 1							
TIME	0	1	2	3	4	5	ROW TOTAL
1	3	3	25	32	44	4	111
2	1	2	12	26	51	7	99
GROUP 2							
1	1	1	14	31	29	5	81
2	0	0	8	28	41	8	85

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APPARENT TRENDS

To establish apparent trends, we had to adjust the negative items.
The normal procedure in attitude measurement is to change the scaling so
the responses are comparable numerically to responses for positive items.
Tables 2 and 3 illustrate the correlation between the paired positive/
negative items, after the negative items have been rescaled.

Table 2: 99% to 97% Correlation Between Paired Items

ITEM 1		
TIME 1		2
GROUP 1	3.37	3.55
2	3.54	3.80
ITEM 23 (ADJUSTED SCALING)		
GROUP 1	3.39	3.60
2	3.57	3.78

Table 3: 97% to 90% Correlation Between Paired Items

ITEM 17		
TIME 1		2
GROUP 1	3.19	3.50
2	3.29	3.58
ITEM 10 (ADJUSTED SCALING)		
GROUP 1	3.09	3.14
2	2.99	3.22

The scores for Group 1 (case method instruction) indicated that the greatest positive shift in mean response occurred in items falling within Category 2 - Planning strategies, such as selection; analysis; solutions; organization. A specific look at two more items will show the shift in mean response and indicate those areas in which we do well in technical writing courses(see Tables 4 and 5).

Table 4: Positive Shift in Student Response

ITEM 3							
GROUP 1							
TIME	0	1	2	3	4	5	ROW TOTAL
1	1	2	4	31	58	15	111
2	0	0	2	20	60	17	99
GROUP 2							
1	0	1	0	13	39	28	81
2	0	0	1	8	46	30	85

Table 5: Positive Shift in Student Response

ITEM 12							
GROUP 1							
TIME	0	1	2	3	4	5	ROW TOTAL
1	0	4	15	39	49	4	111
2	1	2	14	24	51	7	99
GROUP 2							
1	0	0	8	24	41	8	81
2	0	0	6	21	50	8	85

Item 8(The material in this course increased my knowledge of how.professionals work and what they write about at work.) gave a disturbing shift in st dent response (see Table 6). Yet in an anecdotal question asking about cases, a student said, "Cases help a writer put himself in engineer's shoes;" and another student offered, "Cases present actual, real life engineering problems." Perhaps the word "increased" raised an anticipation not met. One student suggested that engineers be invited into the classroom to give first hand experience about technical reports.

Table 6: Enigmatic Shift in Student Response

ITEM 8						
GROUP 1						
TIME	0	1	2	3	4	5	ROW TOTAL
1	0	3	8	13	50	37	111
2	1	1	5	23	44	25	99
GROUP 2						
1	0	2	3	5	33	38	81
2	0	2	3	13	33	34	85

CONCLUSION

This pilot study suggests that an empirically-based, standardized instrument may be used to measure change in student attitude toward technical communication and that the case method of instruction is a viable option in technical communication instruction. However, this questionnaire measures only attitude; it does not attempt to correlate improved attitude with improved writing performance.

This instrument, part of a pilot study, is now ready to be tested in a formal study and may be used in any technical writing class to measure attitude toward technical communication. If you would like to participate in the study, please send inquiries to.S.G. Feinberg, Dept. of Humanities, Illinois Institute of Technology, Chicago IL 60616.

If students have the last word in case method instruction, it is with

this sensible viewpoint: "It is quite difficult to write a report based on a case which is not familiar to you.... Using cases, however, is made much simpler when the professor reviews them with you. Therefore I believe cases should be used if enough time is taken to go over them in class."

THIS ESSAY IS PART OF AN ANTHOLOGY ENTITLED
TECHNICAL COMMUNICATIONS CASEBOOK I THAT IS
BEING SUBMITTED FOR PUBLICATION TO THE ASSO-
CIATION OF TEACHERS OF TECHNICAL WRITING.
(ATTW)

USING CASE STUDIES TO TEACH AN ENGINEERING

TECHNOLOGY TECHNICAL WRITING CLASS

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INTRODUCTION

Many teachers of technical writing must often confront the problem of making students realize the necessity of learning technical communication skills. The main obstacle in their way seems to be that the writing done in the classroom setting lacks purpose or relevance to an on the job writing situation. As a result, many writing assignments simply become a means of completing the course satisfactorily. The case method provides instructors a means of dealing with this shortcoming and teaching the various technical communication skills in real world situations rather than as isolated classroom writing tasks. Students have a much stronger motivation to participate because they can now use their own abilities, intelligence, and experiences in writing solutions to communication problems with a purpose to a specific audience.

EXPLAINING CASE METHOD OBJECTIVES

In order for instructors to use the case method as an effective classroom tool and to motivate participation in cases, students must be aware of the objectives of the course and how cases facilitate achieving them. Therefore, instructors should take the time to explain the objectives and the technical writing skills that are at the heart of the course itself. Specifically, this explanation should focus on solving communication problems, identifying an audience, planning written communications, presenting written communications properly, and using visual aids correctly.

Case studies used as a basis for writing assignments will be effective in helping students center upon the problems they must solve. The case study approach will illustrate why it is necessary to state the purpose of any assignment clearly and in terms appropriate to the reader. The students will then have to consider the possible solutions to the case and evaluate them based on some set of criteria presented in the case. For example, a group of students in an air conditioning class might propose to an elderly home owner an equipment and cost estimate to install central air conditioning in his seventy-five year old home.

Instructors can also use case studies to increase students' awareness of the audiences to be addressed in various communications. Instructors can use a case study to have students recognize the audience in such terms as professional background, personality, and position within a company or organization. In turn, students would have to be aware that the audience might not

share their field of interest. In particul , technical language would be wasted on an accountant who would be making a decision based on cost to an organization.

Case studies also allow instructors to emphasize the importance of planning in the students' writing. If a writing unit dealt with proposals, instructors could offer that type of case to the entire class for discussion of such things as clarifying the subject, considering the audience, or determining what type of action must be taken to formulate a solution to the case. Instructors would get immediate responses from the students and could correct misconceptions that might occur. They would also be able to direct the discussion so that would consider any elements they might otherwise omit.

Used properly, case studies will be effective in giving the students insights into the proper ways to present the various elements that characterize technical communications. A particular case might concentrate on proper phrasing in a set of instructions or why description of individual parts is important to a mechanism description. In yet another case, the emphasis might be on something as simple as the layout form and content of a business letter.

Visual aids are an integral part of technical communication, and students must learn to use them as effectively as their other skills. Case studies can give the students practice in constructing visual aids, but instructors would have to be certain those required by a particular case would be relevant to the students' various technologies.

Many of the course assignments rely heavily on the students' own familiarity with their particular career choice. Therefore, it is important that cases also be directly related to their career field and challenge their knowledge and expertise. The alternative in many situations is lack of motivation and apathy toward the course. Realistic cases force students to take action toward a solution and make them realize what will be expected of them on the job.

INTRODUCING THE CASE METHOD

The success of the case study method as a teaching technique will be dependent to a large extent on how well instructors explain its purpose to the students and the benefits they can secure from it. Consequently, the introduction should contain information on its development and its use in an engineering technical writing class.

The case method involves writing a "true" situation describing a problem that people are trying to solve.[1] Therefore, in an engineering class, cases are presented in a realistic context, provide students a communication problem to solve, a purpose for solving the problem, and an audience for the communication of that solution. Because cases center on communication and not technical and engineering problems, cases give instructors the opportunity to have students practice the different types of writing common to business and industry. Instructors must then stress to students that the writing problems encountered will reflect situations they will find in the real world and the types of people whom they will confront and have to deal with effectively in these situations.

Instructors should place a special emphasis on the benefits the students

should receive from the case method because a great deal of the successful impact of this method lies with the students' desire to participate fully and better themselves professionally. Therefore, they must illustrate to the students that the case method will make the following contributions to their development of their communication skills.

It will make them recognize the importance of communication as part of their professional life.

It will allow them to utilize the types of writing germane to their career preference.

It will make them consider a specific audience and gear their writing toward that audience.

It will make them plan the necessary steps to complete the case successfully.

Also, the case method will help students develop certain managerial skills.

It will discourage their making snap judgements.

It will discourage believing in or looking for the "correct" answer.

It will train them to discuss things with others and to experience the broadening value of interacting with one's equals.[2]

ROLE PLAYING

Cases should allow students to play a role in order to increase interest and desire to become more personally involved. Role playing can bring relevance and more credibility to cases because students now have the opportunity to formulate possible solutions and carry out decisions as an individual who is part of the case. However, instructors must be aware that role playing in a technical writing class is not an end in itself. The purpose of the case is to compel students to solve problems and then communication solutions to a given audience. Further, instructors must also realize that role playing can present several obstacles. According to Peter Klaver, the experience students have had working and communicating in an organizational context ranges widely. Therefore, the need for simulation ranges from zero to total. Also, many students have trouble living with the role and become impatient and hostile to the "game" they have to play particularly when it interferes with what they understand to be the real work they need to do as students.[3]

Instructors who come to terms with these and other problems and decide to use role playing as part of the case should begin their introduction with some of the background concerning the purpose of role playing in cases. They should then continue by explaining the values the students themselves should gain through the technique. Emphasis should be placed on their being able to carry out thought or decision, changing attitudes by playing specified roles, becoming aware of and sensitive to the feelings of others, discovering personal faults, and learning to control emotions.[4]

How students conduct themselves in various roles will be one of the key factors to the success of the role playing exercise. Instructors must stress that a role is a parallel of real life and real world situations. Students are the characters they are playing. Their personal motivations, attitudes, and beliefs are the same as their character's. As their views change through normal discussion and persuasion, so do those of their character. The key to successful role playing is participation without doubt or question in that

role and to play it as if it were a situation they might face under a similar set of circumstances.

CONDUCTING DISCUSSIONS ABOUT CASES

Because their part in the discussion of a case has a direct influence on the ways the student participants will think, make judgements, and form attitudes and convictions, instructors must think of themselves not as discussion leaders but as discussion guides. Accordingly, they must realize their role is to make sure that students understand the issues of the case and then function as expeditors, arbitrators, and molders of the issues involved in the case.

Instructors must realize that their first task is to articulate the case so that all the students are aware of the various issues involved. With an analysis of the issues, instructors can correct misconceptions or fill in gaps in thinking. Several questions concerning the case might lead to better comprehension or shed new light on it completely for some students. An alternate method of determining issues would be for the students themselves to explain the issues in the case as they see them. Karl Vesper suggests that with this method, instructors would also have a team prepare a comprehensive analysis. After individual students presented their facts, the student team would present theirs. With a much more detailed analysis than the individual students, the team could then answer questions from the class and direct a general discussion of the problems involved in the case.[5] As the discussion begins, instructors must be aware of their role of meeting the objectives of the discussion itself. Initially, they should establish an atmosphere which allows for free and direct comments, and they should prepare an environment so that students can interact with other students. As mentioned, their main task is that of a guide controlling the orderly progress of the class through the case and toward a solution. The steps, which force students to rely on their own intelligence, use of skills, and past experiences, include the following:

Reviewing the case content
Stating the problems
Collecting the relevant information
Developing alternatives
Evaluating the alternatives
Selecting a course of action
Scheduling the selected solutions[6]

However, instructors must avoid controlling to the point that new ideas are destroyed or not said at all. A good discussion allows the students to originate ideas, deal with technical and managerial issues, establish priorities, practice skills, and cover material without a lot of instructional interference.[7] Instructors must also be good listeners. As listeners they will readily now the direction the discussion is taking and whether it should be changed. Being aware of the feelings and attitudes of the students as they speak will help instructors know if they are grasping the significant aspects of the case. Listening to comments and conclusions will help instructors determine when to question, elaborate, restate, or supplement issues as the discussion continues. Instructors must see themselves not only as unobtru-

sive evaluators of students and discussion but also as participants in the discussion directing the students toward positive action.

SOLUTIONS TO CASES

The successful solution of a case is the result of the students' ability to deal with facts and figures based on a set of criteria. However, different but nevertheless correct solutions to cases occur because the students participating in them are divergent in personality, professional values, personal backgrounds, and pet concerns. Unless the solutions are totally unacceptable or beyond the scope of the case, instructors should not judge them as wholly correct or incorrect as one might consider the answe. to a math problem. They should realize that varying degrees of solutions are possible or that a number of solutions are possible and acceptable. Failure to consider alternate solutions or lesser degrees of solutions on the part of instructors would smother the students' individual initiative and cause them to narrow their thinking to only those things they believe the instructor wants to hear. To evaluate the solutions to a case most effectively, instructors should have a set of standards which solutions must meet. First, they should successfully meet the rhetorical tasks set forth in the case and then the managerial tasks also found in many cases.

A rating system set up by instructors can balance the overall standings of the solutions depending on how well they meet each of the following technical communication skills.

The communications are acceptable in solving the problem presented
The communications are appropriate for the audiences they address
The communications are properly presented
The communications conform to the conditions given in the case
The communications will give results worth the effort expended

A separate rating system set up by instructors can also rate these managerial tasks.

The solution can be implemented
The solution is easy to implement
The solution is the most obvious to those affected
The solution is economical to implement
The solution is equitable to those affected

As the solutions are rated by these criteria, one will generally emerge as the more acceptable for the particular case. Rarely will any solution finally selected satisfy each criterion to the highest degree. Often times problems arise with the solutions. Therefore, the instructors' balancing of these divergent case solutions must show that the optimum is the one that effectively solves the case and minimizes the effects on the personnel involved.

NOTES

[1]Malcom E. Shaw, et al. Role Playing: A Practical Manual for Group Facilitators (San Diego: University Associates, 1980), pp. 14-15.

[2]Norman R.F. Maier, et al. The Role Playing Technique (La Jolla: University Associates, 1975), pp. 1-2.

[3]Peter R. Klaver. "Writing as Engineers and Writing in Class: Simulation as Solution and Problem." Technical and Professional Communication, Thomas M. Sawyer, ed. (Ann Arbor: Professional Communication Press, Inc., 1977), pp. 158-161.

[4]Maier, pp. 2-3.

[5]Karl H. Vesper. "An Easier Way to Teach With Engineering Cases." Engineering Education. 68 (January 1978), p. 350.

[6]Gordon Kardos. "Points on Using Engineering Cases in Class." Engineering Education. 68 (January 1978), p. 347.

[7]Kardos, p. 347.

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WHY USE CASE STUDIES RATHER THAN

SIMULATION-GAMING TECHNIQUES

OR LIBRARY RESEARCH?

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As teachers of technical communication, we have several choices among methods of teaching our students. Many of us have been trying to get away from obsession with teaching formats or with teaching the classical rhetorical modes. We have been experimenting with methods which present the student with a more challenging and true-to-life situation of needing to conduct research in a problem-solving context--and not thinking about organization or format until research and thinking are complete. Simulation-gaming techniques attempt to teach initiative and creativity; library research has also been used for this purpose. However, case studies provide the greatest opportunities to engage the students in problem-solving situations in which they develop skills as researchers and writers.

Emphasis on structure has been a great strength and a major limitation of traditional writing courses. Students need to learn organization, yet too often they have learned little e'se. Formats have been taught excessively in technical writing courses without sufficient instruction in audience analysis or invention. The modes of traditional rhetoric have undeniable value for teachers and for students, yet too often assignments find apprentice writers cramming and distorting their material into rigid designs or formulae. At best, the student is unable to function outside the artificiality of classroom assignments.

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Some of the artificiality of classroom assignment is alleviated by the nature of the technical writing class itself. Students in business and technical fields who produce mediocre work in traditional freshman composition became competent writers in their own fields as a result of a writing course geared to their future writing needs at work.[1] The congruence of the students' and instructor's goals do not solve the artificiality problem, however. Students are still very far from the conditions under which they will be writing on the job. Cases replicate the complicated problems of professional writing better than any other type of assignment, especially in use of sources, purposes, audience analysis, thinking and composing process, and choice of organization and format.

Seldom is a writer's task in the business and technical worlds anything like the essayist's charge to sit down and create out of his or her imagination, memory, intellect or observation. Technical writers are often given stacks of reading material supplied by others and told to gather whatever additional information they need in whatever way they can. St. Louis colleagues working at McDonnell-Douglas and Emerson Electric tell me that they are often given conflicting information which they must reconcile. They spend a great deal of time talking on the telephone or soliciting information or explanations in person. This interpersonal give-and-take is difficult to duplicate in any method. The case study method can nevertheless simulate the complexities and contradictions of the technical writer's sources.

The oral exchange of information may be stimulated by conducting at least one or two team or group case study assignments. Oral communication ranked high among needed skills in which students desired more instruction when St. Louis Community College conducted a survey of enrolled students in fall, 1980. The case study method employed in teams or groups could help an able

but inexperienced student to gain skills and confidence. It could also help an instructor to help a clearly deficient student and to encourage that student to take a semester course in oral communication.

Another pedagogical aspect of the case study method as a provider of source material is that the reading level can be regulated and comprehension monitored. Appropriate reading level must be a consideration in selecting materials for introductory courses. A minority of students will probably have trouble reading at a high enough level to understand and analyze the information in the cases. Simulation-gaming or library research are methods that can provide camouflage for such students. Poor reading is an increasing problem even at "non-open-door" colleges and universities. Such students will not complete our writing courses or their business, engineering or technical writing programs unless they read at the tenth grade level. The case study method can help us find students' reading problems in time to get them the instruction that is their only hope of completing their programs.

An instructional method that I would recommend even for good students using the case study method is the summary or precis. Technical writers need to be able to grasp the central idea and essential information in what they read. They also need to be able to distill them into brief and accessible forms. The case study method provides material very suitable to these purposes.

All these efforts to gather and comprehend source materials make sense to students using the case study method because they can see the purposes to which their final written product will be put. As John Brockman has emphasized in his definition of a good case study, purpose is essential to a "complete rhetorical context,"[2] and is the most difficult aspect of

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rhetorical context to provide in a writing class. An assignment that is an exercise only in not compelling for the students, as all writing teachers know. Library research assignments, unfortunately, are worthwhile exercises, but still exercises, with the information collected, analyzed and communicated to no discernible purpose. The "real world" sorts of purposes of case studies--including persuasion--are so much more comprehensible to students, in addition to providing more accurate simulation of the work environment and better writing.

. The other problematic part of the complete rhetorical context missing from most writing assignments is audience. We all know how skilled our students become in writing for us, but that this is not the practice they need for their future lives. Case studies provide audiences other than the teacher, and are very specific in describing purpose and audience. Consequently over the course of the semester students have the chance to write for a number of different audiences. The audience, as Father Ong has taught us, is always a fiction,[3] and it takes an experienced writer to be able to imagine and project such a creation. Writing for a number of audiences is the best way to develop this experience in the shortest possible time.

Thinking and composing processes are also different in the case study method than in library research or simulation-gaming. The former is inappropriately academic for technical writing, with temptations either merely to summarize or to subordinate all else to a startling new "thesis." In the case study method problem-solving sorts of thinking processes are encouraged rather than looking for forms or thesis statements to fit the existing information. If the standard library paper is too product-oriented, simulation-gaming is too exclusively preoccupied with process. For technical writers there is always an outcome to brainstorming and other creative

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aspects of composing. Simulation-games stimulate these capacities, but to the neglect of the solitary writing process which is its inevitable conclusion in the life of a working writer.

The end of the process should be the choice of organization and format, and it is in the case study method. As I have said before, technical writing has been too obsessed with format. The case study method leads the student through a natural sequence of complex material, stated purpose and audience without strict specifications on the written product. The student must therefore apply problem-solving and decision-making to the choice of organization and format as the student will often be required to do as a working writer.

The case study method does not solve all instructional problems in teaching writing or in teaching technical writing. It has particular assets for all writing courses, but especially for technical writing courses, in which students are preparing for a lifetime of complex and challenging "complete rhetorical contexts." The case study method is thoroughly problem-solving in orientation and provides the student the best possible chance to prepare to be an ef   ve problem-solver as a working writer.

NOTES

1. MacIntosh, Fred H., "Teaching Writing for the World's Work," The Teaching of Technical Writing, ed. D.H. Cunningham and H.A. Estrin, Urbana, Illinois: National Council of Teachers of English, 1975, p. 24.

2. Brockman, John R., "The Case Method and Technical Communications Pedagogy," unpublished manuscript, 1980.

3. Ong, Walter, S.J., "The Audience Is Always A Fiction," PMLA (1975), p. 9.

PANEL B-10

TEACHING GRAPHICS

IN TECHNICAL COMMUNICATION:

A PRIMER FOR BEGINNING TEACHERS

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The panel presented a cross-section of useable ideas
in the teaching of graphics in technical communication.

One panelist presented, using overhead transparencies,
the standards for evaluating graphics used in technical
reports.

Another panelist demonstrated the use of free, inexpen-
sive, or home-made teaching aids for instruction in
graphics.

In addition, a comprehensive bibliography of useful
references for the instructor of graphics was presented.

SELF-EDUCATION in GRAPHICS FOR TEACHERS OF TECHNICAL WRITING:

AN ANNOTATED BIBLIOGRAPHY AND SUGGESTED READING PLAN

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Graphics are becoming increasingly important in technical communication. Besides the obvious value in clarifying a message, both for the writer during the planning/writing stage and for the audience, current research in how we think and learn points more and more toward the importance of visualization. Consequently, an awareness of graphics is important not only for our students, who need instruction in aids to clear thinking and communication, but also for ourselves.

While we recognize the need for knowledge about graphic communication, few teachers of technical writing have been trained in graphics. Sorting through the plethora of material available on the subject, seeking information appropriate for our needs, may seem a formidable task. The following annotated bibliography and suggested reading plan are offered as a guide for other teachers of technical communication who wish to make graphics an integral part of their teaching. This list of texts is by no means exhaustive, nor is exclusion of any a denial of its merit. Of all those I have examined in my own struggle to educate myself, however, these seem to me the most accessible and the most useful.

A BRIEF READING PLAN

For those who would like a comprehensive view of graphics in a very short time, I suggest beginning with Matthew Murgio's book, for a survey of the whole field of graphics. The second step, and most crucial in effective teaching of graphics, is a personal application of graphic techniques. Henning Nelms' book is an excellent guide, even for people who think they cannot draw. For people with elementary school-aged children, Lee J. Ames' book could turn this step into a delightful parent-child project.

To expand personal applications to include classroom use, James L. Adams' book is superb. It also makes a good bridge into the theory behind the importance of graphics. The single best book on this topic, essential for conviction and adaptability in teaching, is Gyorgy Kepes' essay collection. Finally, for an understanding of the mechanics of graphic production, Arthur T. Turnbull and Russell N. Baird's text provides a good overview.

For the convenience of those who wish to pursue one area more thoroughly or to substitute another text in this basic reading plan, I offer the following classification of the recommended texts:

Survey of the field of graphics: Bowman, Hamilton, Murgio

Detailed instructions in generating graphics: Ames (for children),

    Enrick, Katzenburg, Nelms

Graphic production: Broekhuizen, Turnbull and Baird

Theory behind the importance of graphics: Arnheim, Kepes, Restak

Classroom applications: Adams, Tebeaux, Titen

Reference: Gates (type style) and Society for Technical Communication

    (terminology)

This suggested reading plan stresses the integration of graphics concepts into every phase of the technical communication class and beyond. It emphasizes that graphics are not merely decorations: graphics are a way of thinking.

Adams, James L. Conceptual Blockbusting: A Guide to Better Ideas. 2nd ed.

New York: Norton, 1979.

This book's intention is to make the reader "more conscious of the
creative process, various blocks that inhibit it, and various tricks that
can augment it" (p. 10). Working from the assumption that thinking, like
any other human activity or skill, can be improved, this text offers ex-
amples and exercises (primarily involving vision) in problem-solving.
The exercises are fun and easily adapted for classroom use. Many of
Adams' suggestions seem made to order for technical writing classes, from
invention techniques to graphic charting of organization.

Ames, Lee J. Draw Draw Draw. New York: Doubleday, 1962.

This children's book stresses the pleasure of drawing and leads the
reader through playing with lines, shapes, and dots, to faces, human
figures, and favorite objects. Without any technical vocabulary or
theory, the reader is introduced to graphics vocabulary (point, line,
texture, etc.), design, proportion, and perspective.

This book is an excellent choice for a parent-child self-education
project.

Arnheim, Rudolf. Visual Thinking. London: Faber and Faber, Ltd., 1970.

This book explains why graphics is so important to us. Arnheim concludes
that visual perception is fundamental to thinking. He examines the way
the eye works and juxtaposes it with the way the mind works. We know,
for instance, that we are not limited to flat representation reconstruc-
tion of the physical limited view. In the very act of visual perception,
cognition--thinking--is happening. We see a part of an object, one side
or angle of it, and we recreate the whole in our vision. As we follow
Arnheim's explanation, we begin to understand why.

Bowman, William J. Graphic Communication. New York: John Wiley and Sons,

1968.

This rhetoric of graphics is concerned with "the design of the graphic
figure [,]. . .the language elements available to design, and the
communicative purposes toward which design is aimed" (p. vii). It
demonstrates the influence of focus and purpose on the choice of graphic
illustration, reviews the language of visual art: "a vocabulary of form
elements, a grammar of spatial organization, an idiom of volumetric per-
spective, and a syntax for phrasing the image" (p. 9). Design, then, is

the translating of concepts into visual representations according to purpose. Applications demonstrate the manipulation of language--texture, color, etc.--to achieve subtle variations of emphasis in showing "what," "how," "how much," and "where."

Broekhuizen, Richard J. Graphic Communications. Bloomington, Ill.:

McKnight Publishing Co., 1979.

This text describes in detail the processes in production of graphic communication: design (principles of design, typography, layout), image generation (various machines, including computers, techniques, and devices that aid in preparing the copy and the illustrations), preproduction (paper choice), production (kinds of printing: relief, screen process, gravure, planographic, continuous tone photography, office copying and duplicating), and finishing, binding, and packaging. An overview of graphic communication careers is especially helpful for students. The text is easy to read and thoroughly illustrated.

Enrick, Norbert Lloyd. Effective Graphic Communication. Princeton:

Auerbach, 1972.

This excellent book examines the construction and design of various kinds of charts: those for numerical information (review of fundamental graph forms and more sophisticated combination and synthesis forms), flow charts (process, procedure, dependency, organizational, etc.), decision charts (binary, multiple choice, tree designs), charting grids to aid in designing visual presentation of data (includes samples of grid styles and templates), tabular forms (uses a flow chart to illustrate the process of generating tabular charts), decision structure tables (insures that data needed for routine decisions is at hand and minimizes danger of overlooking necessary detail). It also discusses screen projection of graphic aids, documentation, and designing forms to collect and report data. Check lists for chart and tabular design are included.

Gates, David. Type. New York: Watson-Guptill, 1973.

Part One presents the style categories of type, placing them in historical perspective and describing their distinguishing characteristics. Part Two presents complete alphabets of certain typefaces in several type sizes, organized by style categories. The text gives a good overview of the range of type faces and is a convenient reference for identifying a particular type.

Hamilton, Edward A. Graphic Design for the Computer Age: Visual Communica-

tion for All Media. New York: Van Nostrand Reinhold Co., 1970.

The overview of graphic techniques and their historical contexts is use-
ful for a general definition of the scope of graphic communication. Of
particular interest are the last two chapters, 21 and 22, (pp. 156-81),
which explain the ways a graphic designer can make use of the computer,
and point to the wide application, present and future, of computer
graphics.

Katzenberg, Arlene Chmil. How to Draw Graphs. Kalamazoo, Michigan:

Behaviordelia, Inc., 1975.

Designed for psychology students, this programmed text leads the reader
from identifying and analyzing the appropriate data to be graphed through
the basic construction of graphs, meeting APA specifications. Ten "rules"
are presented sequentially, with ample illustrations for the reader to
test comprehension: "1) center the graph; 2) label the axes; 3) print
the labels parallel to the axes; 4) place the grid marks; 5) scale at
equal intervals; 6) plot the data points; 7) connect the data points;
8) write the legends; 9) use geometric forms; 10) limit one graph to a
page" (p. v). This book makes very few assumptions of knowledge and is
ideal for the reader with little math background.

Kepes, Gvorgy, ed. Education of Vision. New York: George Braziller, 1965.

This collection of essays rests on two assumptions:

First, that there is a fundamental inter-dependence between percep-
tion and conception, between the visual and the rational. The ex-
perimental evidence in support of the idea that sensory functions
belong to an interdependence system--that there is a primordial
unity of sensory and motor processes--is extended to include a
corresponding interdependence between the sensory and the intellec-
tual: between art and science. And second, that because the visual
factor has been for so long misunderstood and consequently neglected,
there is an urgent need today for a re-evaluation of the education of
vision.

(P. vii)

The essays begin with three psychologists' analysis of our visual per-
ceptions as they influence the way we think, further develop visual
abilities. and create. The second group of essays explore ways vision
facilitates understanding of our physical environment. The third group
"deals with concrete techniques for visual education" (p. vi), and the
fourth group offers a brief overview of current visual education.

Murgio, Matthew P. Communication Graphics. New York: Van Nostrand Reinhold

Co., 1969.

Beginning with the value of visual representation of information, kinds
of data amenable to charting, and the benefits and perils of charting,
this text explains how to chart information: understanding the basic
geometric designs used in charting various kinds of information to par-
ticular purposes, the mechanics of organizing and designing the data
chart, the use of pictorial charts, and the impact of color. Substantial
consideration is given to preparing live presentation of the visual data:
choice of medium (hand-out, chalk board, overhead, film, etc.), planning
with the facilities and the particular audience in mind, and the per-
formance. A brief overview of computer capacity with the cathode-ray
tube and potential in graphic communication concludes.

Nelms, Henning. Thinking with a Pencil. New York: Barnes and Noble, Inc.,

1957.

This book is "intended for two groups: (1) those who wish to use drawing
as a tool for thought and communication but lack the knowledge of how to
make a drawing and (2) those who are accustomed to draw but want to en-
large their graphics vocabularies and extend the range of fields in which
they can apply the abilities that they already possess" (p. vii). It
describes and illustrates various kinds of charts (which take little or
no drawing-skill), labeling techniques (reducing representational draw-
ings to more diagramatic kinds of rendering), tracing and stick figures,
proportion, measurement, and alignment, and fixed-line construction.
Nelms emphasizes seeing and using the geometric shapes inherent in things
and explains ways of treating numerical data and using mechanical aids.

Restak, Richard M., M.D. The Brain: The Last Frontier. New York: Werner

Books, 1979.

A highly readable explanation of how the brain works. Of particular
interest to those of us concerned with language and the impact of vision
is ch. 10, "The Jekyll and Hyde Solution" (pp. 187-231), which explores
the relation between right and left brain.

Society for Technical Communication. A Glossary of Graphics and Technical

Art Terms. Washington, D. C.: STC, 1971.

A handy reference tool for unfamiliar terms.

Tebeaux, Elizabeth. "Using Computer Printouts to Teach Analysis and Graphics." *Journal of Technical Writing and Communication* 11, no. 1 (1981), 13-22.

Tebeaux suggest using computer printouts of membership lists as a source for generating graphic aids. The exercise gives students first-hand practice in using computer printouts, in analyzing data, and in con- structing appropriate charts.

Titen, Jennifer. "Application of Rudolf Arnheim's Visual Thinking to the Teaching of Technical Writing." *The Technical Writing Teacher*, 7, no. 3 (Spring 1980), 113-8.

Titen offers a very specific lesson plan and classroom exercise sugges- tions.

Turnbull, Arthur, and Russell Baird. *The Graphics of Communication*. 4th ed. New York: Holt, Rinehart and Winston, 1980.

Primarily concerned with the mechanics of graphics, the text describes elements of communication: verbal (type), visual (illustrations and color), and design (layout), then traces the actual production process. The strength of the text is its insistence on context. Set against the broader background of communication theory, the historical developments of each element are considered in their influence on traditional practice, with special emphasis on current computer impact.

TEACHING GRAPHICS IN TECHNICAL COMMUNICATION CLASSES

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ABSTRACT

Because graphic aids can often convey and clarify information more effi-ciently and accurately than words alone, it is difficult to find technical writing that does not use graphics. Yet because many technical communication teachers are recycled literature or composition teachers who are not trained to use or to teach the use of graphic aids, many are reluctant to do so and others are frustrated in their attempts. Still others are stifled because they do not have budgets or equipment that provide for slides or other rela-tively expensive methods of acquainting students with a wide variety of graph-ics. This paper suggests ways of accumulating and presenting graphic illus-trations on a shoestring budget: collecting graphics from companies' annual reports and laminating them for workshop use or putting them on a flip chart for classroom presentation, creating overhead transparencies to demonstrate different levels of effectiveness of graphic aids, and bringing in graphic artists for question/answer periods or in-class workshops. Also included are an extensive handout as an introduction to graphics, sample assignments, and a selected and annotated bibliography.

TEACHING GRAPHICS IN TECHNICAL COMMUNICATION CLASSES

Illustrations in books date back to fifteenth century woodcuts, and today's sophisticated variety of technical graphics grew out of a need to make relatively complex subjects easily understandable. World War II forced industry to build new, complex products; this created a need for technical illustrations to help train workers, and thus accelerated the growth of graphic illustration. Today the visual media is used for training and in-struction in business and industry, government, and education. Graphic aids are used to convey and clarify information, to show trends and relationships--to bridge a communication gap, to enable nonspecialists to grasp specialized information. Perhaps because we are undergoing a video revolution, perhaps because of our increasing sales to non-English speaking markets where graphics can help explain the products, perhaps because of the decreasing communication skills of our work force, graphic aids are becoming more and more widely used and more and more important.

Because many technical communication teachers are recycled literature or composition teachers who are not trained to use or to teach the use of graphic aids, many are reluctant to do so and others are frustrated in their attempts. Yet it is difficult to find technical writing that does not use graphics; in-deed, many types of statistical or complex data are difficult or even impos-sible to convey by words alone. Often this information can be conveyed much

more efficiently and accurately by pictures, graphs, diagrams, tables, or other graphic aids.

We've all heard the now overworked cliché that a picture is worth a thousand words, but that's not always true. (I had that startling revelation a few years back when I assigned an 800-1000 word essay in my freshman composition class and one student showed up with a picture!) Sometimes it takes a lot of words to explain a picture--but something seen is often better understood and better remembered, more thought-provoking and more palatable.

Realizing the importance of graphic illustrations in technical communication, I set out to learn about them. I too have a background in literature but through a fortunate set of circumstances wound up teaching technical communication. In pursuit of literature degrees I of course wrote a lot of papers, but I never used graphics in them. So this was initially my weakest area in technical communication. I was a bit wary of and intimidated by anything new to me and by technology and the gadgets that go with it--afraid to try my hand at creating graphics (much less try to teach others how to use graphics), confident that the minute I tried something new and even semi-complicated in the classroom, Murphy's Law would immediately go into effect.

But, determined to become at least halfway proficient in this area, I began to note and study how others use visual aids--the kinds of information they present and its overall effectiveness for a particular audience and a particular purpose. I wrote to several major companies, asking for their annual reports--all chock-full of delightful graphic illustrations. (Perhaps because they assumed I was a potential stockholder, they were all very gracious about adding my name to their mailing lists--so now I'm under a constant barrage of annual reports.) Many of these illustrations are large enough to be used in a flip chart, and some of the smaller ones I've laminated so students can examine them in in-class graphics workshops. For my flip chart I purchased a very inexpensive ($4) artist's sketchpad, and I've found that this works as well as slides or other presentations requiring more costly or complex equipment. The flip chart is simple and quick to produce, it requires no special lighting or equipment, it can easily be changed or added to, and it's economical. (Some of us who choose to live and work in the Ozarks get paid partly in scenery, so we have to cut all the corners we can.)

Another method that is almost as easy and inexpensive to prepare and use is overhead projection. The projector is simple to operate--even for nontechnical liberal arts folks--and can be used in normal lighting. I use multiple overlays to demonstrate different levels of effectiveness in graphic illustrations. I can face my students during the presentation; and I can write, draw, or point out items as I speak.

Still another profitable method of acquainting students with the use of graphics is to invite a specialist to class--someone from the school's technical illustration department (if it has one), or a graphic artist from the community. I've found that people with these skills are happy and proud to share them with others, and I think my students benefit from an informal question-answer session with an expert.

I certainly do not profess to be a graphics expert; I have not specialized in graphic illustration and I teach no courses in that subject. Nor do I profess to produce graphic artists. But in my technical communication classes I work with students from a variety of majors, many of whom will get no training in graphic illustration elsewhere. Because I believe graphic illustration is an important aspect of technical communication and also important to these future professionals, I try to at least make my students aware of the needs for and possibilities of visual aids--and when, where, why, and how to use them. I try to acquaint the students with the wide variety of graphic aids used today, but I stress the basics: tables, line graphs, bar graphs and pie graphs, organization charts and flow charts, photographs, and drawings. I do not cover such topics as orthographic drawings, perspective illustrations, schematic diagrams, or axonometric illustrations--because I see no profit in spending time discussing methods of illustration for which neither I nor they have the equipment or expertise. Moreover, I believe those who will be expected in their careers to produce such illustrations will no doubt get training on the job or in graphics or technical illustration courses. (I do, however, provide sources for any who wants to tackle more complicated illustrations.)

I require my students to use graphics in their definition and process papers and in their major technical reports. I accept reproductions of others' illustrations, and I believe there's some value for the students even in this. But of course I'm more favorably impressed with the illustrations they design and produce. I realize that they have limited (if any) experience, and I understand their initial lack of confidence. Though most of them rely on a few basic illustrations (tables or simple graphs), I stress that there's little that's sacred about technical illustrations, and I urge them to be creative. I encourage them to try their hand at color, not only for its attractiveness but also because it has high memory value and promotes association. I introduce them to Chart Pak and Transfer Type, systems of rub-off lettering, and show them that even their fellow students and their totally unartistic teacher can produce professional-looking illustrations with the help of these systems. I'm pleased if they leave the class with an appreciation for the value of graphics and an understanding of how to adapt graphics to different audiences and different purposes, how to integrate them into the text, and a few general principles for their use.

Let's not be illiterates in a strange and unknown area, intimidated by technology and all that goes with it. Realizing the importance and increased use of graphic illustration, let's help prepare our students, our future professionals, to be better communicators--to be able to communicate with more than mere prose. If we do less, we do them a great disservice.

Introduction

Graphic aids are visual supplements to verbal presentations. They may be quantitative, emphasizing numerical values, or qualitative, emphasizing relationships. They are compact presentations of data that enable readers to visualize a great deal of information at a glance. Tables, graphs, charts, drawings, diagrams, photographs, and maps are examples of graphic aids.

Illustrations in books date back to fifteenth century woodcuts, and today's sophisticated variety of technical graphics grew out of a need to make relatively complex subjects easily understandable. World War II forced industry to build new, complex products; this created a need for technical illustrations to help train workers, and thus accelerated the growth of graphic illustration. Today visual media are used for training and instruction in business and industry, government, and education. Graphic aids are used to convey and clarify information, to show trends and relationships--to bridge a communication gap, to enable nonspecialists to grasp specialized information. Perhaps because we are undergoing a video revolution, perhaps because of our increasing sales to non-English speaking markets where graphics can help explain the products, perhaps because of the decreasing communication skills of our work force, graphic aids are becoming more and more widely used and more and more important.

General Principles

Sight is probably the most highly developed of our senses, and for most of us something seen can be better understood and more easily remembered. Graphic illustrations can often attract attention and provoke thought much more readily than can pages of text. (See, for example, Figures 1 and 2 below.)

Figure 1.

Gasohol

HOME GROWN FUEL

Figure 2.

What then now?
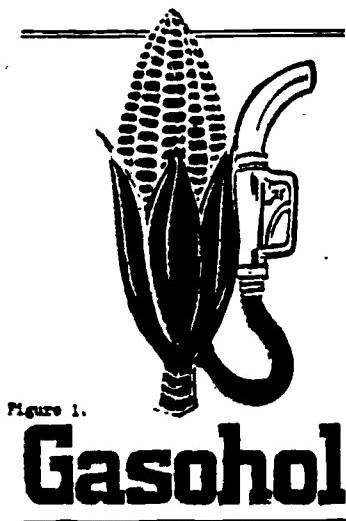
Also, we are a tv/comic book generation, and we are more likely _o be inter-
ested in illustrations than in straight prose. Yet graphic aids must be
functional, not just embellishment. And if they are to be effective and
meaningful--or even palatable--they must be well designed and well placed.

Certainly a graphic aid should be chosen with a particular audience in
mind. Whatever is most suitable for the audience and for the purpose of
the presentation, whatever will communicate best, should be used. Graphics
should not be cluttered with unnecessary information; nor should they be used
indiscriminately, for they can distort, mislead, and confuse.

Each graphic aid should be numbered and titled, and each of its parts
should be appropriately labeled. If the graphic was taken from another
source, that should be identified parenthetically after the title or beneath
the illustration. If the graphic was developed with data from another source,
that too should be noted.

Although most graphic aids are created to support an immediate verbal
presentation, their ultimate use may extend far beyond their immediate objec-
tive. If they are worthwhile, they will probably be reproduced--and this
usually means in black and white. So they should be planned so that they'll
be reproducible; that is, they should not depend on color for their meaning.
But this does not mean that color should be avoided; indeed, the use of color
can make graphics much more appealing and thus more likely to attract and
maintain interest.

Ideally, graphic aids should be placed within (never before) the text
where they are discussed--as near as possible to the most pertinent text.
General, supplementary aids that might interrupt the reading of the text
should be reserved for an appendix. The reader should be referred to the
graphic when it is most appropriate for him to look at it.

Tables

Tables contain two or more parallel columns of data. (All other types
of graphic aids are called "figures.") Though they are less appealing and
interesting than pictorial presentations, they are excellent for organizing
and depicting statistics. Tables are usually the best means of presenting
large amounts of data concisely and exactly.

Informal tables, which are merely a continuation of the text, do not
require a frame, a number, or even a title. They are used to break up a
page of text and to make explanations brief and simple.

Formal tables require more white space and should be titled, numbered,
and cross referenced. All columns must be labeled (in parallel grammatical
form). Whole numbers are aligned by the right-hand digits, and others are
aligned by the decimal points.

Tables I and II below illustrate two approaches to table-making; Table II obviously tries to embellish the statistics with a pictorial background.

Table I. Number of Persons by Age and Sex: 1970		
Age	Male	Female
Total persons in U.S.	98,912,192	104,299,734
Under 5 years	8,745,499	8,408,838
5 to 14 years	20,759,233	19,986,482
15 to 24 years	17,551,116	17,390,253
25 to 44 years	23,448,597	24,546,641
45 to 64 years	19,992,043	21,817,726
65 to 74 years	5,437,084	6,998,372
75 years and over	2,978,624	4,651,422

Table II
MISSOURI DERAILMENTS 1979
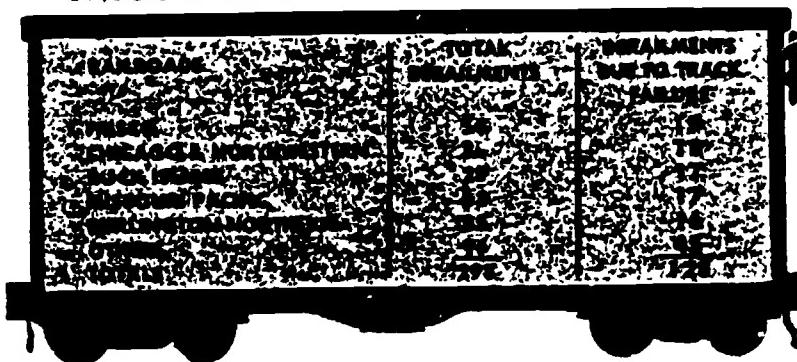
Illustration / Mike Willis

These figures for 1979 are provided by the Missouri Public Service Commission.

Graphs

Graphs present statistical quantities visually so that trends, changes, and cycles can be readily identified. They can be used to illustrate data that would require more time for study and analysis if it were presented in a table. Usually they are not as precise or accurate as a table, but they can make a point more strikingly (see Figure 3).

Figure 3
YEARLY COST OF SYNFUEL VS. OIL
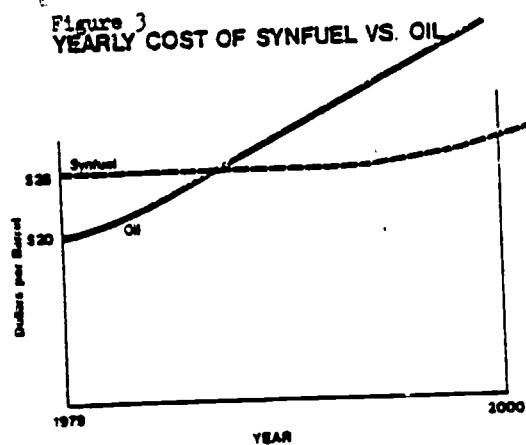
Though they deal with numerical quantities, graphs emphasize change rather than amount. (Sometimes the terms "graphs" and "charts" are used interchangeably. In this guide they are used interchangeably except "chart" is also used to describe visual aids that deal with non-statistical information, such as the organization chart and the flow chart.)

Graphs have horizontal scales (usually for plotting independent variables) and vertical scales (usually for plotting dependent variables). Each scale must be labeled, of course, as must any symbol used in the graph.

Line graphs use one or more lines to depict changes in the value of a variable quantity (or quantities). (See Figures 4 and 5.) They visually dramatize trends, amounts, and results over a period of time; they are good for comparing series and are most commonly used to present data corresponding to consecutive time periods. (See Figures 6 and 7.)

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Figure 4.

NET EARNINGS AFTER TAXES
(MILLIONS OF DOLLARS)

Figure 5.

EARNED PER SHARE
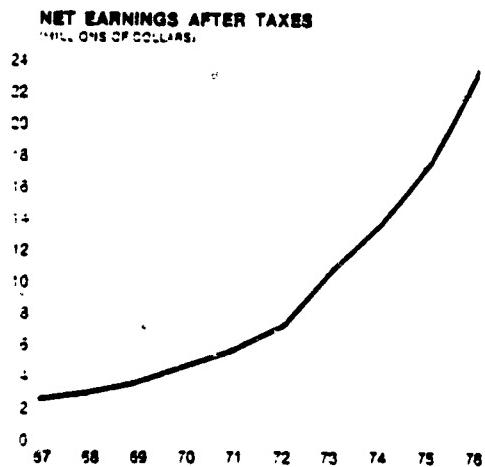
percent increase
since 1965
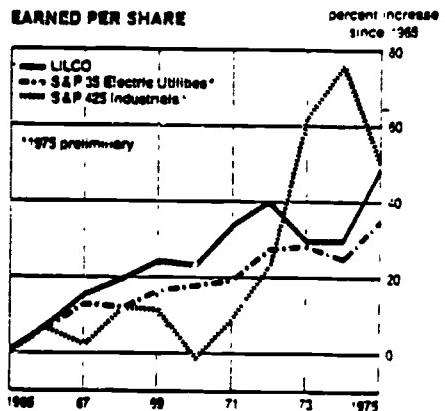
The 48% increase in LILCO's earnings per share since 1965 has been greater than that of the Standard and Poor's electric utility average and almost equal to that of the industrial average.

Figure 6.

**Sound capitalization ratios consistently maintained.**

Millions of Dollars
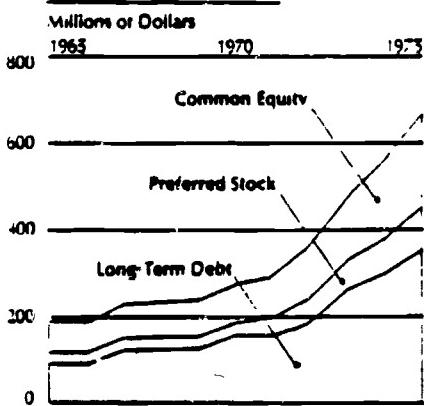
Figure 7.
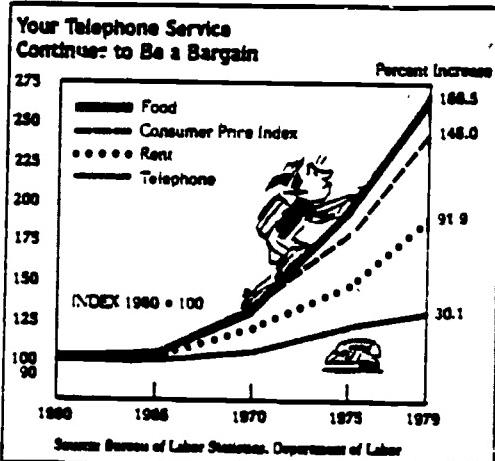
When the lines of a graph depict a continuous natural process, they may be smoothed or "faired"; otherwise, lines are drawn from point to point. When a series of lines are used the layers they create can be filled in with different colors or shading patterns; this is called a layer graph (also called a surface or strata graph). (See Figure 8.)

Figure 8.

U.S. PRODUCTION AND CONSUMPTION, ALL OILS, 1920-1977
(Billions of barrels per year)
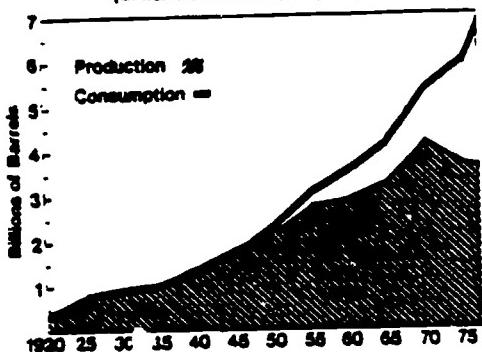
Bar graphs, rectangular blocks of color or shading on a simple grid,
are perhaps the simplest type of visual aid to prepare and to understand.
They provide striking comparisons between a limited number of items.
They may be drawn either horizontally or vertically; usually vertical bar
graphs (also called column graphs) show the amount or size of one item at
different periods of time (see Figures 9 and 10), whereas horizontal bar
graphs show different amounts of more than one item at the same time (see

Figure 9
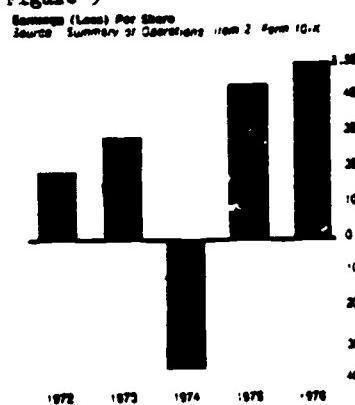
Figure 10.
Population of the United States
Total Number of Persons in Each Census: 1790-1970
Number in Millions

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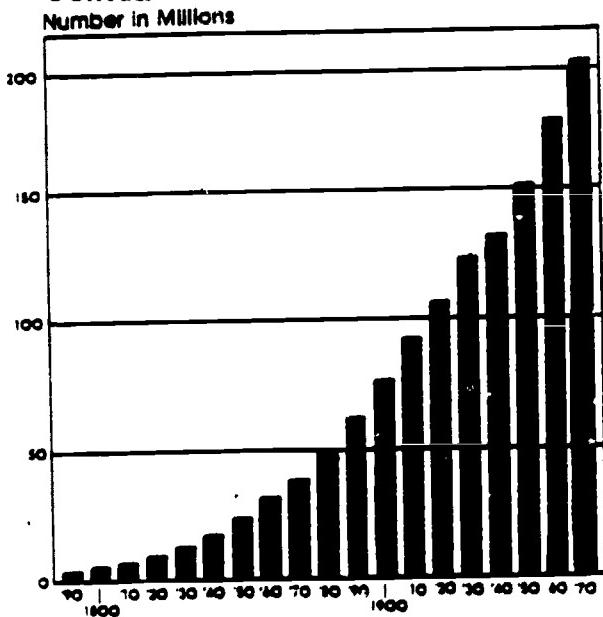
Figure 11). Sometimes a combination line-bar graph is used to compare two or more variables (see Figure 12).

Figure 11.
Number of Persons
by Age and Sex: 1970
Number in Millions
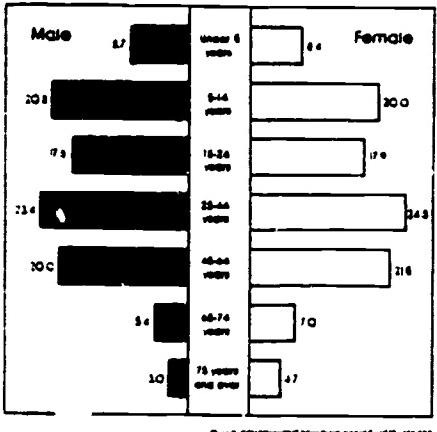
Figure 12.
Capital Spending versus Private Employment
(percent change from prior year)
1950-1976
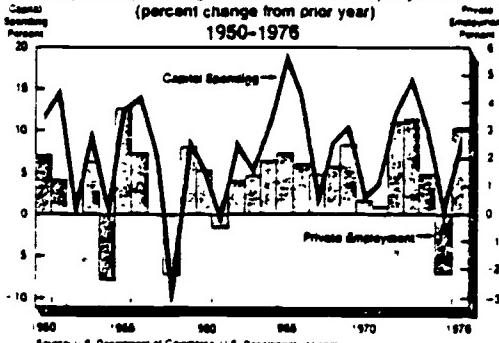
In addition to the multiple bar charts just discussed, a <u>subdivided</u> <u>bar graph</u> (also called 100% bar graph) can be used to depict the relative size or percentage of each of the parts of a whole (see Figure 13). Segments can be differentiated from each other by colors, shading, or texturing.

Figure 13.
SOURCES OF FUNDS
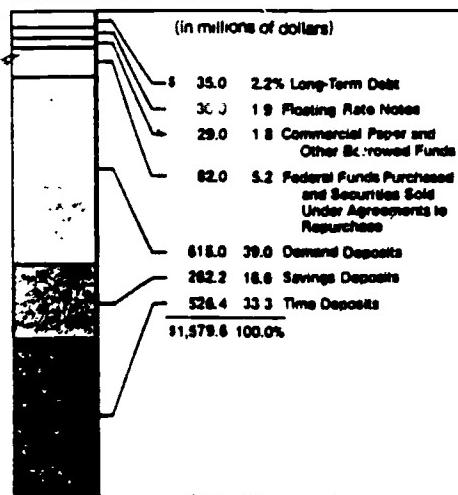
Pie graphs (also called circle or sector graphs) vividly depict divisions of a whole into its component parts. The circumference of the circle represents 100%, and it is divided into segments ('r slices) representing proportions or percentages of the whole. The pie is first sliced at the 12:00 o'clock position, and moving clockwise the slices are cut in order of descending size. (See Figure 14.)

Figure 14.

The state and local government dollar, 1970 (U.S Bureau of the Census)


Where it comes from..

Where it goes
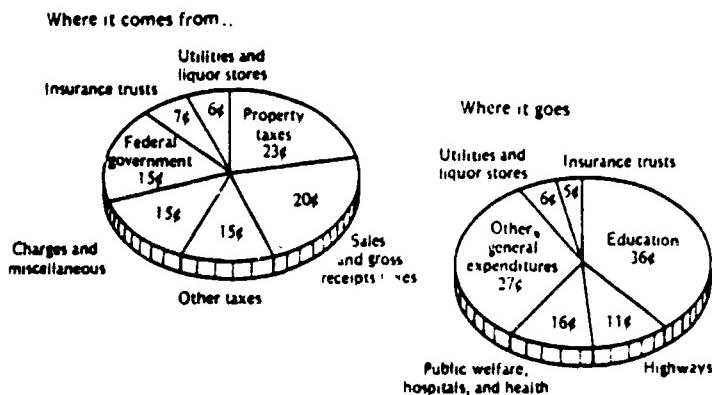
Pie graphs are perhaps not the most accurate way to present data, but they make it easy to compare parts to each other and to the whole. And they have a strong visual impact, a dramatic emphasis. They are most effective when there are few divisions and a wide range of proportions. Generally there should not be more than six or eight sections; very small percentages probably show up more vividly in a bar graph.

Charts

As noted earlier, graphs can also be called charts, but here the word "chart" takes on an additional meaning and refers to graphic aids depicting non-statistical information.

Organization charts present not statistical data but rather the distribution of functions, personnel, and authority within an organization. They are an excellent way to show lines of authority and levels of responsibility. The organization chart on the next page depicts one company's executive hierarchy.

Figure 15. Executive Hierarchy


```
        ┌─────────────┐
        │  President  │
        └──────┬──────┘
               │
        ┌──────┴──────┐
        │    Vice     │
        │  President  │
        └──────┬──────┘
        ┌──────┴──────┐
   ┌────┴────┐   ┌────┴─────┐
   │Marketing│   │Personnel │
   │Director │   │Director  │
   └─────────┘   └──────────┘
```
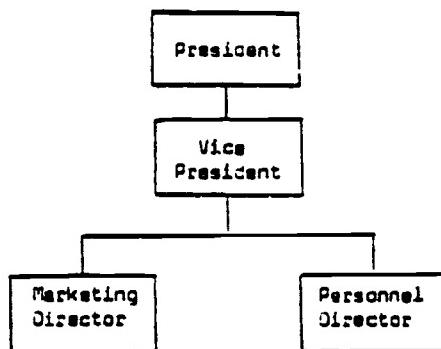
Flow charts depict various steps of a process or the flow of a product from beginning to completion, as can be seen below. The steps are represented by geometrical figures or by drawings suggesting their actual appearance.

Figure 16. Preparing Wood for Painting
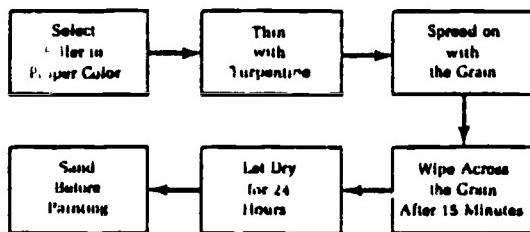
Photographs

Photographs provide realism and authenticity; in technical writing they are used not only to assist verbal description but also to prove the truth of assertions (see Figure 17). Photographs are limited, however: they can show only the surface, and sometimes they unavoidably present insignificant facts. Also, they are often difficult and costly to reproduce.
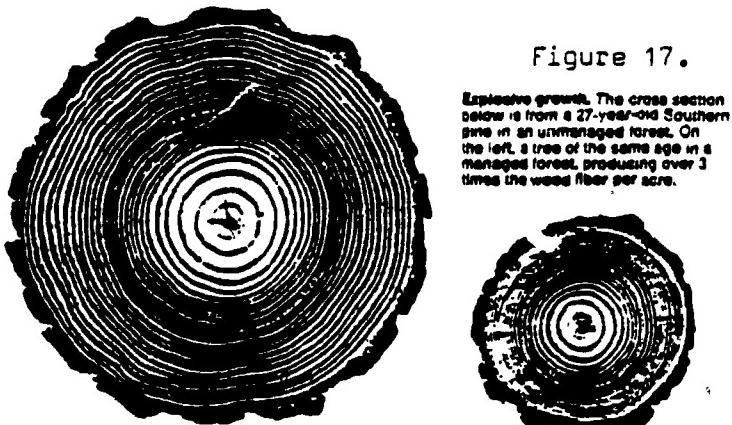
Figure 17.

Explosive growth. The cross section below is from a 27-year-old Southern pine in an unmanaged forest. On the left, a tree of the same age in a managed forest, producing over 3 times the wood fiber per acre.

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Drawings

Drawings are often fairly complex and require some skill to produce. This does not mean, however, that amateurs can't put them to good use; note the neat illustration below, drawn by a student. Drawings are often the best method of picturing the relative shape and location of objects, and they have two advantages over photographs: they can picture the interior as well as the exterior of an object, and they can omit the insignificant and emphasize the significant.

Figure 18. Front End from a 1965 Chevrolet Corvair.
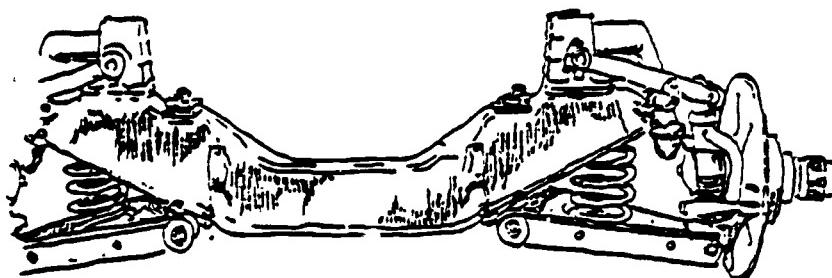
ASSIGNMENTS

● 1. (From journals, reports, brochures, etc.) collect and bring to class
     samples of graphic aids, along with their captions and supporting text.
     Be prepared to discuss their effectiveness.

● 2. Convert the following information into a table.
     Texas County, Missouri, experienced a drought in 1980. In January it
     received only .32 inches of rainfall, compared to the normal 2.66 inches.
     February, however, supplied 2.84 inches, more than the normally received
     2.25 inches. March was another exception, providing 4.63 inches, where-
     as the normal March rainfall is only 4.24 inches. But in April the norm
     is 4.27 inches, and the county received only 2.49 inches; and the May
     average is 3.97 inches but Texas County received only 2.56 inches. The
     trend continued in June: Texas County registered only 2.05 inches of
     moisture, as opposed to the normal 4.58 inches. And again in July:
     only .68 inches for Texas Countians, compared to the usual 4.14 inches.
     August and September continued the trend--1.12 and 2.10 inches, respec-
     tively, instead of the normal 3.68 and 4.16. In October, however, the
     county received more rainfall than usual: 3.98 inches rather than 2.74
     inches. But November and December reversed that short-lived trend, pro-
     viding only 1.92 and .64 inches in lieu of the normal 2.53 and 2.25
     inches, respectively. Thus the county suffered one of the worst dry
     spells in its history, receiving a total of 25.33 inches of rainfall,
     16.14 inches short of the normal 41.47 inches.

● 3. Draw an organization chart depicting the following information: South-
     west Missouri State University is under the general control and manage-
     ment of its Board of Regents. The President is the chief executive of
     the University, responsible to the Board of Regents. The Dean of Facul-
     ties, the major academic officer of the University, serves under the
     president; and five deans are responsible to him--the Dean of Arts and
     Humanities, the Dean of Business, the Dean of Education and Psychology,
     the Dean of Science and Technology, and the Dean of the Graduate School.
     Department heads are responsible to the deans; for example, the Head of
     the English Department is responsible to the Dean of Arts and Humani-
     ties--and then the English Department faculty are responsible to the
     department head.

● 4. Construct a line graph that presents the following information: Our
     university has grown from 400 students in 1909 to 14,350 students in
     1979. This is how the growth pattern can be traced: 500 students were
     here in 1919, 1048 students were here in 1929, and 1615 students were
     here in 1939. In 1949 the headcount was 1877, in 1959 it was 2711,
     and in 1969 it was 8192.

● 5. Fifty people took Technical Writing last semester. Of these, 10 re-
     ceived A's, 20 received B's, 15 received C's, and 5 received D's.
     Draw a circle graph showing the percentage of students receiving each
     grade. Then draw a divided bar chart depicting the same information.

GRAPHIC COMMUNICATION: A SELECTED BIBLIOGRAPHY

Enrick, Norbert Lloyd. _Effective Graphic Communication_. Princeton:
     Auerbach, 1972.
     Thorough, non-technical discussion of how to create and use many
types of charts and tables.

Magnan, George A. _Using Technical Art: An Industry Guide_. New York:
     Wiley-Interscience, 1970.
     An overview of graphics in American industry that explains when, why,
and how to use them. Discusses drawings, diagrams, charts, graphs, photo-
graphs, slides, posters, filmstrips, and transparencies; and includes a
list of advantages and disadvantages for each.

Murgio, Matthew P. _Communications Graphics_. New York: Van Nostrand
     Reinhold, 1969.
     Chapters on types of charts and graphs and how to draw them, using
color in graphic aids, and planni nd making presentations with graphic
aids (including a chapter on prese. .tions using projected material).

Pocket Pal: A Graphic Arts Digest. 12th ed. New York: International
     Paper Company, 1979.
     Graphic arts handbook that discusses printing: history, typefaces,
composition, paper, inks, plate making. Has one chapter on graphic arts
photography and a glossary of graphic arts terms.

Turnbull, Arthur T., and Russell N. Baird. _The Graphics of Communication:
     Typography, Layout, Design_. 3rd ed. New York: Holt, Rinehart and
     Winston, 1975.
     Basic introduction to graphics and communication theory. Chapters on
graphic illustration (photography and charts), typography, printing pro-
cesses, and aspects of layout and design (contrast, balance, proportion,
rhythm, grouping).

(Also, most technical communication textbooks contain useful chapters on
the use of graphic aids.)

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A GRAPHICS PRIMER FOR ENGLISH TEACHERS

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SUMMARY

Technical writing, when taught in engineering curricula, is taught primarily by English teachers. While English teachers readily adapt methods of teaching general composition to technical writing formats, the acquisition of skills necessary for teaching graphics presents some difficulty. English teachers rarely have a background in drafting or even analytical techniques applicable to graphics. This paper presents a simple, step-by-step method of teaching students how to draw different types of graphs. Each step is illus-.trated by a drawing. Some audience analysis for the determination of appropriateness of the use of different types of graphs is included.

INTRODUCTION

Technical writing, when included in engineering curricula, is taught primarily by English teachers. These teachers rare'y possess advanced degrees in technical communications, but generally have an academic background in literature or composition. The transition from composition to technical writing requires a change in the teaching of written material and also an understanding of graphical material. The second is particularly important, because engineering reports rely heavily on graphics. Reports may use up to 80% of space for figures with written material only acting to introduce or comment on figures.

If a comprehensive course in technical writing is to be offered, graphics must be taught as an essential component. Since English teachers rarely possess extensive drafting skills or sophisticated math backgrounds, the tendency is to avoid graphics or rely on student or engineering faculty expertise. This is unnecessary if teachers accept two basic ideas:

1. They are the audience, hence, graphics used by students are good if the teacher understands them.

2. Graphics are very similar to paragraph construction.

Use of graphics is covered by one and only one criterion: they should be used if they are more effective and efficient than words. It must be

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emphasized that both the effectiveness and efficiency are governed by audience. If they do not meet both criteria, graphics becomes analogous to "empty words", best deleted or replaced. To be effective and efficient, graphics must tell their story more rapidly, completely and clearly than an equivalent space of words alone could. Graphics, as used by engineers, fall into five categories:

1. "Draftings"

2. Drawings

3. Photographs

4. Computer Output

5. Graphs

"Draftings" may be defined as a drawing using stylized engineering symbols. These range from electrical circuit schematics, to computer flow diagrams, to assembly drawings. They are meant for technical audiences and, unless fully understood by the instructor, are best left out of a technical writing course. Engineering students, most of whom have taken a course including drafting, are easily able to add more sophisticated types of drawings. The addition of these drawings implies an audience narrowed to that of the highly "technically literate." The emphasis in a technical writing course needs to be on the harder task of conveying technical information to the general public. In fact, even for writing within the engineering community, more sophisticated material should be placed in appendices, since reports are also read by upper management who have neither the time or expertise for detail.

Drawings, for the purposes of this paper, are defined as non-stylized illustrations. In engineering reports, they are used to show designs not yet executed or are used in place of photographs when photography is unfeasible, impossible or too costly.

Commercial photography is a highly specialized field, with technical products as one of its branches. Criteria for acceptability are functional rather than aesthetic.

Computer printouts, unless meant for circulation among computer experts, need editing and extensive formating to be worthy of inclusion in the body of the report.

Graphs used by engineers fall into four categories:

1. Line graphs, cartesian coordinates

2. Line graphs, special coordinates

3. Bar graphs

4. Pie charts

Bar graphs and pie charts, frequently used in newspapers and magazines, are appropriate for any audience. Line graphs require a modicum of mathematical literacy, while specialized line graphs are best left for a scientific audience.

This paper deals specifically with a prescriptive method of drawing graphs. In addition, techniques for using graphs effectively in the body of a report are also discussed.

PROCEDURE

The statement of the problem in graphics is simply:

GIVEN: Data

FIND: Graphical representation

The method is outlined below, with illustrated explanations for each step on the following pages.

METHOD:

1. Choose appropriate paper.

2. Choose and draw axes leaving correct margins (1½" on left, 1" on top, bottom and right, after all lettering).

3. Choose scales on axes. A maximum portion of paper remaining after margins should be used. Scales should conform to graph paper lines.

4. Show scale captions.

5. Title axes with variable name, symbol and units.

6. Plot data.

7. Connect data points.

8. Title graph.

9. Show key.

Steps 1-5 and 8-9 are common to all types of graphs, while 6 and 7 are dependent on the type of graph. Each step will now be discussed and illustrated.

1. Choose appropriate paper.

I. Choose appropriate type of paper.

   a. Linear paper - used for representation of general
      information particularly to a non-technical audience.

   b. Logarithmic paper - scales graduated in logarithmic
      divisions. Used for presentation of data ranging
      from very small to very large.

   c. Semi-logarithmic paper. The vertical scale (usually)
      is logarithmic while the horizontal scale is arithmetic.
      Used for determining relative changes or patterns in data.

   d. Bar graphs. Used for easy interpretation by general
      public.

   e. Pie charts. Used to present percentage relationships
      in a population.

II. Choose appropriate grid size.

   a. Linear paper is available in various numbers of lines
      per unit length, i.e., 2 lines per cm., 10 liner
      cm. Choose the appropriate number of lines per
      length for the required graph. The data should be
      plotted using as much of the paper as possible (max-
      imum resolution). Paper should also be chosen so
      that convenient intervals (multiples of 2, 5, 10)
      occur on major lines (every inch or cm.).

   b. Logarithmic and semi-logarithmic paper is available
      in varying numbers of cycles per page, i.e. 3 cycle
      semi-log. Each cycle represents a power of 10, i.e.,
      one cycle runs from 1000 to 10,000. The appropriate
      paper to represent given data must be chosen.

   d. Bar graphs are easily drawn on linear graph paper.
      The relative width and height governs paper choice.
      Bar graphs can also be drawn on plain white paper.

   e. Either polar coordinate or percentage paper may be
      used for pie charts. Polar paper necessitates con-
      version of percentages to degrees, but has the advan-
      tage of easy variability of pie size. Percentage
      paper saves one step, but does prescribe pie size.
      Again, plain white paper may be used.

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2. Choose and draw axes leaving correct margins (1½" on left and 1" on top, bottom and right, after all lettering).

   The margins indicated are appropriate for a full page graph. These margins conform to those required of a manuscript. If the graph is to fit in a smaller space, margins are chosen to set the graph off from the text. Since reducing copiers are readily available, it is suggested that the graph be drawn to approximately double size for better resolution and then reduced to conform to spacial allocation.
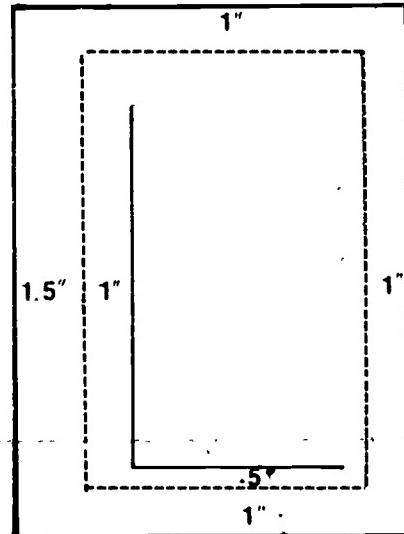

FIG. (1)

3. Choose scales on axes. A maximum portion of paper remaining after margins should be used. Scales should conform to graph paper lines.

   The horizontal axis should be used for the independent variable (the one you control or vary during an experiment) and the vertical should be used for the dependent variable. Data presentation can be manipulated by axis choice. A long vertical axis can make small variations seem exaggerated, while a compressed axis supresses data variation.
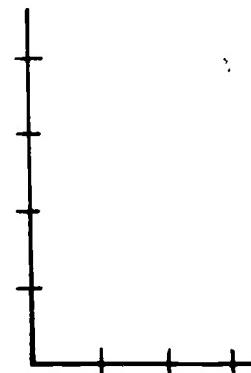

FIG. (2)

4. Show scale caption.

   Tick marks should be used for all major intervals. Not all ticks need to be labeled. Labeling should be sufficient to allow for easy identification of coördinates of points on the curve.
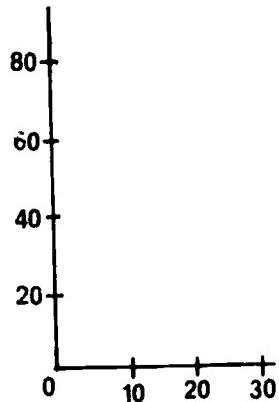
FIG. (3)

5. Title axis with variable name, symbol and units.

   The axis title should use a standard term for the variable. The symbol is used if the variable is referred to by the symbol in the text or if the symbol adds information. Units should always appear on the axis.
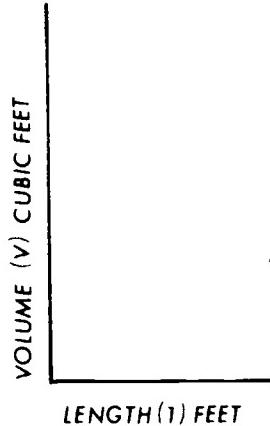
FIG. (4)

For line graphs (Arithmetic, Semi-
log or Log-log):

6. Plot data using symbols such
    as circles, squares or tri-
    angles to indicate data points.

    The symbols perform two func-
    tions; they indicate at which
    point data was taken and they
    serve as a guide for drawing
    the curve. The symbols may
    also be used to indicate un-
    certainty in data. If more
    than one curve is drawn,
    different symbols should be
    used for each curve.
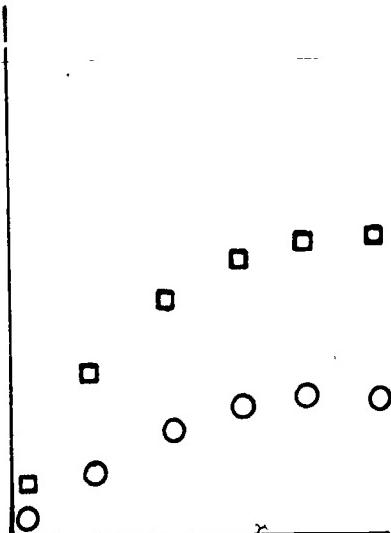
FIG. (5)

7. Draw the curve through all
    points. If the data is dis-
    crete, where one point is
    not related to the others
    (example: cost of car insur-
    ance as a function of the
    age of the car) points are
    connected by straight lines.
    If the data is continuous, a
    curve should be used. The
    curve should not obliterate
    data points plotted.

    A dense line should be drawn
    through the data. If more
    than one curve is drawn per
    graph, different line sym-
    bols should be used for
    each curve.
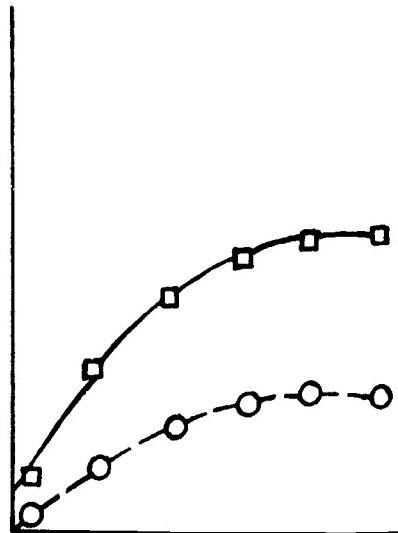
FIG. (6)

For **bar graphs**:

Steps 1-5 are followed as for line graphs.

6a. Construct bars.

Spaces can be left between bars if discrete information is to be indicated. Alternately, related bars can be grouped, (see Fig. 14) or all bars can be drawn adjacent to each other to better indicate a trend.
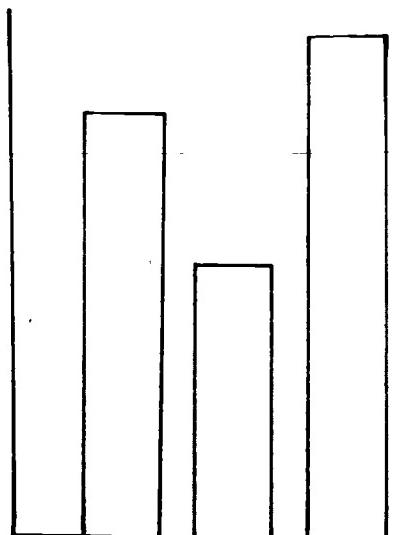
FIG. (7)

6b. Draw in horizontal grid. The horizontal grid should not pass through the bars.

The horizontal grid helps in determining the value of each bar. If the grid is omitted, the value associated with each bar can be added inside the bar or directly above the bar as shown in Fig. (8).

FIG. (8)

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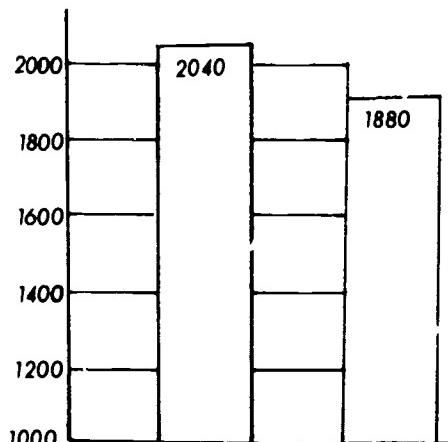
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7. Cross-hatch or darken bars.

   If more than one set of infor-
   mation is shown on a bar graph,
   a variety of shading techniques
   with a key should be indicated.
   This is shown in Fig. (14).
   The cross-hatching can be effec-
   tively done using dry-transfer
   shading. Alternately, it can be
   inked or, if equipment is availa-
   ble, computer generated.
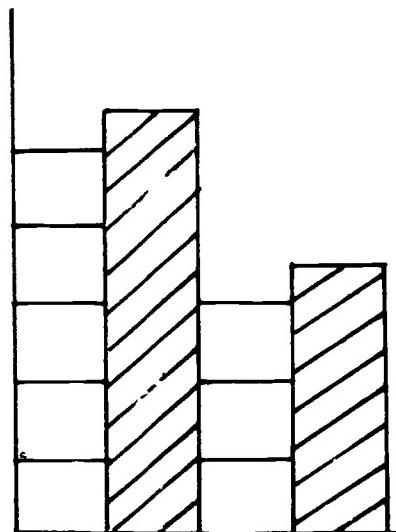
FIG. (9)

For a Pie Chart:

Steps 1-5 are followed as for line
graphs.

6a. Calculate data into percentages.

   Calculate degrees needed for
   each portion of data (note
   circle = 360^0).

Field	Number of Students	Percentage	Degrees
Licensed Practical Nursing	210	21	76
Registered Nursing	430	43	155
Respitory Care	75	8	29
X-Ray Technology	60	6	22
Dental Technology	130	13	47
Medical Records	52	5	18
Dental Assisting	37	4	14
	994	100	361*

*Round off error causes the one degree deviation from 360 degrees.

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7a. Draw circle.

If percentage is used, the
circle is predrawn. On polar
paper, the size is chosen.
The circle's size is governed
by the amount of information
to be conveyed.
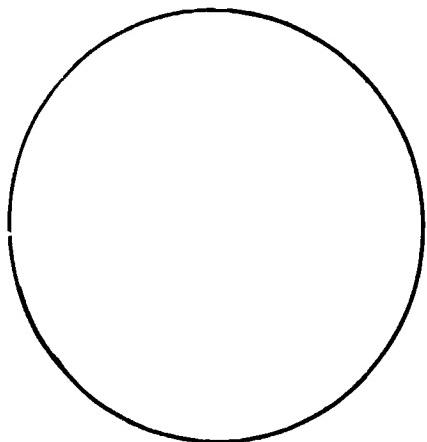
FIG. (10)

7b. Divide circle into parts
calculated in part 6a.
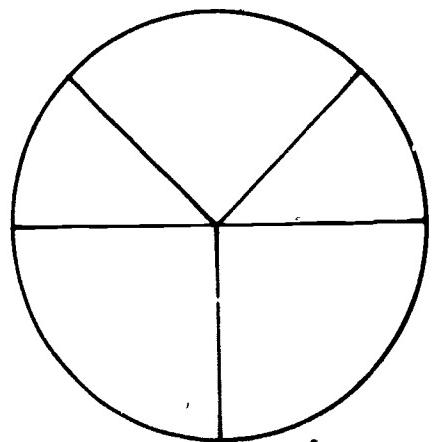
FIG. (11)

7c. Label all sectors. Small
sectors should be labeled
outside. Label should
include the name of the
variable and percentage,
and/or actual number
represented.
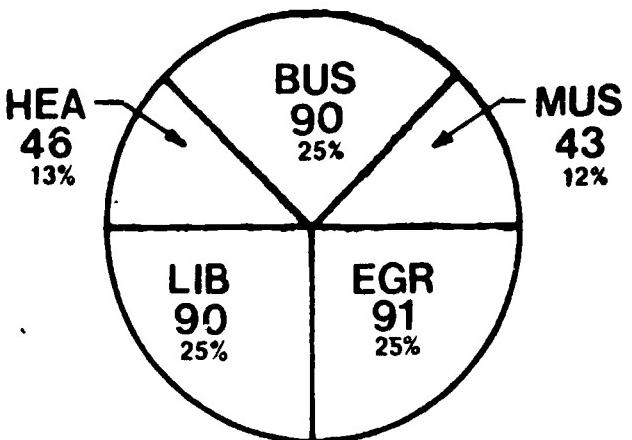
FIG. (12)

8. Title graph.

The title of the graph
should be self-explanatory.
If the title is to be in-
cluded in a list of fig-
ures, it should be more
comprehensive.
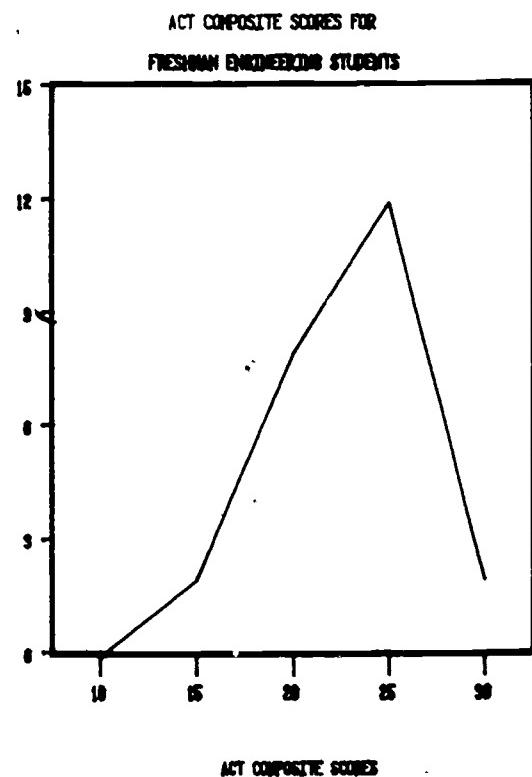
FIG. (13)

9. Show key.

The key is used to reference either the symbols for data points, the lines for graphs or the shading for bars.
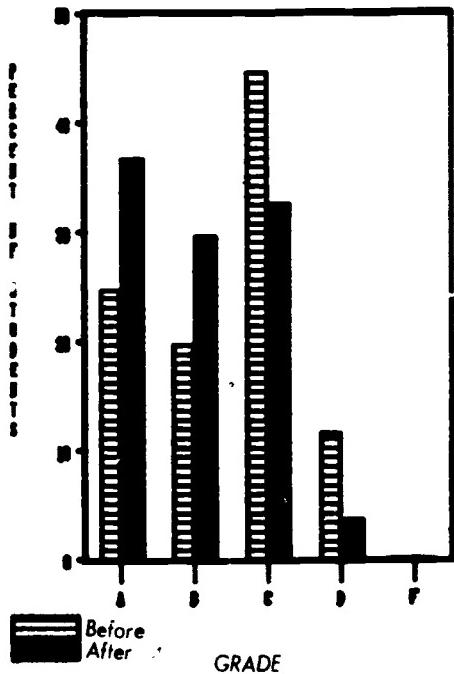
FIG. (14)

CONCLUSIONS

The mode of representation of data has been shown to be a function of the data itself and of the audience. Thus, bar graphs and pie charts in the forms shown or in more cartoon-like forms seem to be immune to math anxiety, and hence, appropriate for all audiences. A fat person helping himself to a piece of pie labeled "defense" and a small, skinny soul helping himself to one labeled "education" shows the budget picture efficiently and effectively to anyone. Similarly, a line graph showing horsepower versus r.p.m., tells an engineer an engine's characteristics.

A graph by itself may or may not be a good paragraph. The title acts as a topic sentence. The graph itself is the body and optimum points or trends should act as conclusion. Not all graphs are sufficiently self-explanatory or perform the function of total paragraph. Graphs then, can be relegated to the role of body of a paragraph. Introductory sentences are then needed. The topic of the graph and conditions under which data for the graphs were gathered, are generally sufficient. After the graph is shown, highlights of it can then be discussed. This discussion becomes the concluding portion of the paragraph.

The criterion of "Do I understand this?" must be definitive of judgement

of the value of a graph rather than a judgement of the teacher's lack of
expertise. An engineering student's technical communication skills are defin-
itely enhanced by dealing with a teacher/audience who clearly establishes
limits of technical literacy.

Biography

Dr. Brillhart received her B.M.E. at the Cooper Union in 1960 and her
M.S. (1964) and Ph.D. (1967) at the Illinois Institute of Technology. She is
a member of the Society for Experimental Stress Analysis, the American Society
for Engineering Education, American Society of Mechanical Engineers, Society
of Women Engineers and the Society of Technical Writers and Sigma Xi. Her
publications are in the areas of experimental mechanics, engineering education
technical writing, and women's equity. Her present areas of research inter-
ests are CAI, team teaching, video education ard learning styles.

Ms. Debs received her bachelor's and master's degrees in English from
Rosary College and is presently pursuing a doctorate at R.P.I. She is a mem-
ber of the American Society for Engineering Education, Society of Technical
Writers and numerous English associations. She has taught at Triton College
and R.P.I. and has published extensively in the area of technical communica-
tions.

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Applied Tagmemics: A heuristic approach to the use of graphic aids in technical writing

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When we first became interested in the teaching of technical writing, we brought to this interest only our experience in teaching traditional composition courses, an experience that included a solid background in the different heuristic approaches to teaching writing. All such approaches, of course, are intended to help writers tackle their subject from various, yet systematic, points of view. As an aid to invention for the writer of traditional rhetoric, they are invaluable tools for adding needed depth and dimension to the student's examination of a subject. As we prepared for our new teaching assignment, we came across familiar complaints about technical writing and technical writers, complaints that the writers often did not seem to know what data to leave in and what should be discarded, that they seemed hesitant to draw forceful conclusions and make clear cut recommendations, hedging these most interpretive sections of their report with a plethora of data, both verbal and graphic. In other words, the problems seemed to lie, not in the writers' grasp of their technical problems and solutions, but in their methods of communicating these to others. As we analyzed these complaints, it became increasingly clear that the problem was two-fold: it was first a problem of invention -- what kind of material should be included and, second, it was a problem of arrangement -- how the material should be presented. These questions depended, in turn, upon knowing who read the report and how these readers would use the information.

From our work in the traditional composition field, we knew that a consistent heuristic approach to a subject enabled students to view their topic both objectively and analytically, since heuristics necessarily force them to look at the framework within which both topic and response to that topic exist. What we hoped to do was to find a heuristic method which would be flexible enough in its approach to enable students of technical writing -- whose topics are invariably of the problem-solving variety -- to examine their technical material in terms of the framework within which it is used, namely, the purposes to which it will be put by the readers.

The choice of a particular heuristic suitable to technical writing and to visual rhetoric in particular was our next step. We needed a heuristic, we felt, that fit the criteria set by Janice Lauer, in her description of a metaheuristic; the heuristic should be:

- transcendent, non-data conditioned, transferable
- have a flexible order yet be sensitive to cues from the material to which it is applied
- highly generative, allowing the thinker fluidity and flexibility.1

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The tagmemic heuristic developed by Pike, Becker, and Young and presented
in their volume, <u>Rhetoric, Discovery, and Change</u>, proved to be just such
a heuristic. The tagmemic heuristic, having its source in the sciences,
was a problem-oriented heuristic, one generated to deal with data as a problem
to be analyzed and solved. It was a heuristic that readily transferred to
the data-oriented area of technical writing, a heuristic that could be
manipulated to generate an infinite amount and variety of material if
handled correctly. In addition, we found the heuristic to be exceptional
in its capability for handling data from a variety of perspectives. The
heuristic generates information based on the concept of commonality or, as
Becker, Pike and Young state:

> "The motive for communication arises from an awareness of difference
> and a desire to eliminate it or at least to modify it. But there
> can be no interaction between writer and reader, and no changes
> in their thinking, unless they hold certain things in common, such
> as shared experiences, shared knowledge, shared beliefs, values
> and attitudes, shared language." 2

The temptation in technical writing is to let the facts speak for
themselves, to ignore the necessary human organization that must surround
fact to make it useful to the corporation, to ignore the "shared" element
that use of the tagmemic heuristic promotes. Giving in to such temptation,
the technical writer can then subject his report to the familiar complaint:
lack of organization, lack of focus, inclusion of irrelevant data.

The problem for the technical writer, then, is primarily a problem of
figuring out how to get his material across clearly and quickly to his
audience. Basically, it is a problem of translating the data into a common
context. We define translation as a method of establishing mutual understanding
between reader and writer. The tagmemic heuristic assists this translation
process in that it enables this type of understanding. This is achieved
because the heuristic examines material in a variety of ways and perspectives:

- as a particle, it examines the facts and data at hand
- as a wave, it examines the acts or the sets of operations involved
- as a field, it examines the systems and the sets of relationships in which
the data is involved

Because of its versatility, thoroughness, and wide applicability, we believe
the tagmemic heuristic can be applied to virtually all the rhetorical questions
a writer must ask as he or she starts to organize and translate his or her
technical data into a readable and useable report format. It is as systematic
and consistent as any of the scientific methods which students use in dealing
with their technical tasks.

Since graphics are one variation of reporting information in a technical
report, the tagmemic method can also be used to show students how they can
best understand graphics and their function within a report format. In
applying the heuristic to graphics we made the following assumptions:

1) The primary objective of a graphic is to attract the reader's immediate attention through its visual presentation - it is an appeal to the reader's sensory response to the message before the reader considers the message intellectually.

2) Graphics increase a reader's intellectual understanding through a multi-dimensional presentation, allowing the reader a second perspective on information which he or she has already received verbally.

Graphics should be studied as a rhetorical form and, as a rhetorical form, they can be studied in and of themselves and then contextualized by being positioned accurately within their appropriate format.

The main strength of the tagmemic method of inquiry is that it deals with three basic perspectives: it examines an item as a static entity -- what it is; it examines an item as a dynamic process -- what it does; it examines an item as a system -- how it works within a structure. Given this approach, the writer readily develops an understanding both of the nature of the graphic and its effect upon the reader.

We now ask you to examine both the questions presented by Becker, Pike and Young in their text Rhetoric, Discovery, and Change and our rather brief analysis of the use of bar graphs and line graphs using their method.

127   THE HEURISTIC PROCEDURE

	Contrast	Variation	Distribution
PARTICLE	1) View the unit as an isolated, static entity. What are its contrastive features, i.e., the features that differentiate it from similar things and serve to identify it?	4) View the unit as a specific variant form of the concept, i.e. as one among a group of instances that illustrate the concept. What is the range of physical variation of the concept, i.e., how can instances vary without becoming something else?	7) View the unit as part of a larger context. How is it appropriately or typically classified? What is its typical position in a temporal sequence? In space, i.e., in a scene or geographical array. In a system of classes?
WAVE	2) View the unit as a dynamic object or event. What physical features distinguish it from similar objects or events? In particular, what is its nucleus?	5) View the unit as a dynamic process. How is it changing?	8) View the unit as a part of a larger, dynamic context. How does it interact with and merge into its environment? Are its borders clear-cut or indeterminate?
FIELD	3) View the unit as an abstract, multi-dimensional system. How are the components organized in relation to one another? More specifically, how are they related by class, in class systems, in temporal sequence, and in space?	6) View the unit as a multidimensional physical system. How do particular instances of the system vary?	9) View the unit as an abstract system within a larger system. What is its position in the larger system? What systemic features and components make it a part of the larger system?

Applied Tagmemics: A Heuristic Approach to the Analysis   Kirtz/Brownlee
                      of the Use of Graphic Aids in   Case Western Reserve
                      Technical Writing

	Bar Graph	Line Graph
Block I Particle/Contrast	- is positioned on a matrix - has an X-Y axis - individual bars, either horizontal or vertical, are positioned on matrix	- is positioned on a matrix - has an X-Y axis - dots along axix connected linearly.
Block II Wave/Contrast	- use of <u>bars</u> to indicate dimension, proportion among parts of whole	- use of linearly connected <u>dots</u> to show increase/decrease in dimension, amount, proportion
Block III Field/Contrast	- all parts in a bar graph work to show the precise proportions between at least two items for purposes of comparison - can be temporal, but spatial is <u>best</u> represented by the bar graph	- parts here stress variation in dimension between at least <u>two</u> points - emphasis is on temporal and sequential
Block IV Part/Variation	- can have limitless number of bars, differentiated by use of color or pattern - X-Y axis not an absolute necessity except for precision - can have multiple-bar graphs, negative bar graphs (to the left of the axis)	- can have limitless number of linearly connected dots, differentiated by color or line variation (broken line, dotted line, etc.)
Block V Wave/Variation	- significance of information changes according to type of bar graph used - change in axis value also possible	- Axis can stand for any numerical value, time, space or sequence
Block VI Wave/Field	- multiple bar graph (parts within the graph are highlighted - 100% bar graph (stress is parts-to-whole - sliding bar graph (stress is on negative as well as positive)	- temporal (stress in on trends over period of time) - sequential (stress is on cause/effect)

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	Bar Graph	Line Graph
Block VII Part/Distribution	- shows comparisons, proportion between parts f a whole, between different wholes - emphasis is atic presentation of da	- shows companrisons of sequences - emphasis is on dynamic presentation of data
Block VIII Wave/Distribution	- focus on static comparison divided into appropriate proportions	- focus on a dynamic comparison - emphasis is on movement of data
Block IX Field/Distribution	- good for showing dimensions, proportions of data for comparison purposes - emphasis is on stasis - focus is on the data itself, on the parts themselves	- good for showing movement, trend of data for comparison purposes - emphasis is on dynamics, change, flow of data rather than on dimensions of each part per se

By examining the graphs in this manner, it should be clear that the focus has consistently moved from seeing the graph as a type of pictorial description of data, to a type which emphasizes a specific element of that data, namely, the relations of parts to the whole. When a writer uses this analysis with a specific piece of data, this outward movement is more clearly discerned than in our brief presentation here. Obviously, if the emphasis the writer finds does not serve the purpose of the writer or the needs of the audience, it should be discarded in favor of some other method of illustration.

The main virtue of this analysis is that it allows the writer to see the nature of the graphic aid as more than just a visual rendition of data; it allows him or her to see how the graphic translates the data for the reader making the relation between content and its context clear and explicit. Thus, it allows the writer to see that establishing a relation between data and graphic alone is not enough; the writer must see which graphic best informs the reader in terms of the purpose to which the report's information will be put, and this relationship between the message, the audience, and the purpose is the singular, most important context of the technical report.

In technical report writing, two needs which writers must meet if their reports are to be useable by an audience are the language needs and the technical needs of that particular audience. A heuristic analysis helps writers to decide the most suitable format for their information; that is, they must decide whether the information should be presented verbally or visually. Verbal choices lead to finding a suitable language level for their audience; visual choices lead to decisions about finding suitable graphic types for their audiences. Thus a heuristic approach helps writers to move away from focusing merely on their data, directing them outward towards an examination of that data within its functional context. The report writing process, then, is not seen as the unwieldy sum of disparate parts, but as an organic whole which can be divided and subdivided according to the writer's purpose, but which always functions as a totality. The tagmemic heuristic, because it itself follows a process of deconstructing and reconstructing information, lends itself to being a useful approach to the teaching of technical writing. By applying the abstract questions this heuristic asks to specific parts of the writer's report, the writer can analyse the language and technical needs of the audience, examing the viability of the solution within the givens of the corporate structure, and decide which graphic or verbal format will best suit the writer's purpose. By following such a method, the writer can arrive at answers which are both specific and thorough in their range of application.

End Notes

1. From lecture notes at the University of Detroit Seminar on Rhetoric, June, 1979.

2. Richard E. Young, Alton L. Becker, and Kenneth L. Pike, Rhetoric, Discovery, and Change (New York: Harcourt, Brace & World, 1970), p. 172

3. ibid., p. 127

Panel B-14

Expanding the Role of Technical

Writing in the 1980s

A CATHOLIC VISION OF TECHNICAL WRITING

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Although one of the obvious characteristics of technical writing is its technical subject matter, it would be very difficult to say precisely what a technical subject is. For our purposes, however, it will be sufficient to say merely that a technical subject is one that falls within a general field of science and engineering.[1]

> Mills and Walter, _Technical Writing_

Any attempt . . . to define technical writing is complicated by the recognition that exposition is often creative. Because technical writing often employs some of the devices of imaginative writing, a broad definition is necessary. Defined broadly, technical writing is that writing which deals with subject matter in science, engineering, and business.[2]

> Blickle and Passe, _Readings For Technical Writers_

I should like to propose that the primary, certainly not the soul, characteristic of technical writing lies in the effort of the author to convey one meaning and only one meaning in what he says. That one meaning must be sharp, clear, precise. And the reader must be given no choice of meanings; he must not be allowed to interpret a passage in any way but that intended by the writer.[3]

> W. Earl Britton, "What Is Technical Writing?"

These three definitions have one common theme -- the recognition that technical writing is extremely difficult to define. This recognition may someday prove embarrassing to academicians and frustrating to practicing technical writers. What technical writing teacher, for example, can defend to his or her students the statement: "Technical writing" involves "technical subject matter"?

Practitioners, in turn, will encounter a different problem. The continuing trend toward specialization can only mean a continued growth of technical terminology -- even clerics now talk of financial management, not collection plates. This increasing specialization will draw more non-technical people into technical areas. As a result, a number of writers previously outside the domain of technical writing will begin to label themselves as -- or, as the case may be, avoid the label of -- technical writers.

Let this analogy clarify the issue. Personnel outside of industry often assume electrical and chemical engineers have similar jobs -- both are, often all, engineers. Industrial personnel, however, never make such a naive mistake. In the same vein, personnel outside of academics and industry often assume technical writers and composition instructors have similar jobs -- both deal, after all, with writing.

But here the analogy falls apart. For this assumption is not only made from outside but also from within -- by professionals within industry and academics. Why? One reason is technical communicators have provided stylistically attractive, window-dressed definitions of their profession, definitions with ornament but no substance -- e.g., "Technical writing is good writing." These definitions have failed to establish meaningful standards by which a piece of writing can be labeled as technical or non-technical.

The point is obvious. A measurable definition of technical writing is needed. This definition should set demonstrable standards by which a written message can be classified as technical or non-technical. The purpose of this article is to set forth standards for beginning these classifications. These standards are by no means all inclusive, but they do provide a start, a base that others can be added to.

These standards are:

    1. Point of View

    2. Focus Models

Point of View

One common characteristic of a technical piece is its proportionally higher use of impersonal than of personal subjects. This tendency results partially from the presence of the passive voice but even more from the

impersonal nature of the subject matter. Jane Walpole, for example, notes that "scientific prose may show far more passives than narrative prose . . . . The difference merely reflects the differing natures of content, purpose, and audience."[4]

Whatever the cause, this characteristic provides a quantitative standard for defining technical writing -- the ratio of impersonal to personal sentence subjects. For purposes of an initial definition, a written piece must have a two-to-one or higher ratio of impersonal to personal subjects in order to be labeled technical. A personal subject is any personal pronoun (I, you, we, etc.) or any personal name (John, Mary, etc.). Other proper nouns are counted as impersonal. Imperative sentences, having no written subject, are also counted as impersonal.

Table 1 demonstrates results obtained from a point-of-view analysis of written samples taken from six different fields. The analysis consisted of an examination of ten memos, reports, or letters randomly selected from each category.

TABLE 1: POINT-OF-VIEW RATIOS

	Percent Impersonal Subjects	Percent Personal Subjects
Internal Bank Memos	77.1	22.9
External Governmental Communiques	43.1	56.9
Internal Mid-Level Management Communiques	68.9	31.1
External Audit (10-K) Reports	77.6	22.4
Direct-Mail Sales Letters	58.9	41.1
Literary Articles	59.4	40.6

An interesting aspect of the point-of-view criterion is that it broadens the fields technical writing traditionally covers. Banking and accounting, for example, are two fields seldom looked into by technical consultants.[5] Likewise, management communiques are seldom thought of as technical documents. Perhaps some much needed technical writing training for mid-level managers may be in order.

The concept of point-of-view has a second interesting aspect as well -- it provides a clear distinction between business and technical communication. Business communicators make avid use of personal subjects; technical writers do not. Therefore, the point-of-view ratio provides an easy way to make a clear distinction between these two first-cousins of expository writing.[6]

By no means, however, should point-of-view provide the only measure of a communique's technical nature. The philosophic writings of Kafka, Camus, and Kierkegaard are certainly complex and difficult but few would defend them as technical in the modern sense of the term. For this reason at least one other standard needs to be established. One that provides a second useful distinction is the Focus model.

Focus Models

Most expository writing falls into one of two Focus models: 1) an Action/Decision model, 2) a Passive/Being model. For our purposes technical writing is always in the Action/Decision model; non-technical writing is always in the Passive/Being model. Let's briefly examine each of these focuses.

Action/Decision

Action/Decision models have an applied focus. The subject of the message at one time or another involves some sort of external action in a physical realm. This action may be expressed monetarily, geographically, structurally, or in some other external form. The point of action may take place in the past or be planned for the future. Look at the following Action/Decision letter.

> Mr. Joe Jones
> Head, Data Operations
> XYZ, Incorporated
> Opp, AL   35480
>
> Dear Joe,
>
> Enclosed are the results of the study just completed at XYZ, Incorporated. A section on the operation of the 1234 Retail Store System, itemized benefits and cost, and a financial analysis are enclosed.
>
> This system should provide many benefits, as well as significant dollar savings. By creating magnetic tapes and scanning them at the point of scale with the 1234 terminal, you efficiently capture all the data necessary for inventory management, sales analysis, and check authorization. This can lead to a reduced dollar investment inventory, personnel productivity, better management of the retail operation, and significant dollar savings.

I definitely recommend the installation of the 1234 Retail
Store System.

> Sincerely,
>
> Mary Smith
> Data Analyzer

This writer obviously has some future action in mind for the reader --
installation of this system. Thus, the letter fits the Action/Decision
description. But what if the last sentence of this letter is dropped?
Suddenly, the letter looks like an FYI ("For Your Information") report. Does
it still have an Action/Decision focus?

The answer is yes. The point of action shifts from the future to the
past, with the emphasis on actions taken. But the overall model is still
action-oriented. This emphasis on past action means a number of informa-
tional memos and process reports meet this second criterion. And rightfully
so, for these communiques are often reports on previous external activity.

Passive/Being

No actions or decisions are involved in Passive/Being models. Agreement
or disagreement is the main response. There is, of course, the action option
of a written or oral rebuttal -- or the contention of an astounding revela-
tion leading to a shift in life styles. But this is philosophical hair-
splitting and its likelihood is remote. Look at the following example of a
Passive/Being passage:

> The oral period is important in THE FREE-LANCE PALLBEARERS,
> too. Reed sees the United States as that monstrosity, a
> child empowered to carry out his fantasies of agression and
> destruction without the restraints of morality -- in short,
> an Oscar. Harry Sam has a personal home economist, Mlle
> Panda and a Personal Sister Lenore "who wears a nun's habit",
> to invent and serve "new exotic recipes" using children's
> flesh as the main ingredient."[7]

One may, of course, be appalled, elated, or disgruntled by this inter-
pretation, but the only rational future action is mind-oriented. No ex-
ternal action -- except, again, a written rebuttal -- may occur. A focus
analysis of the previously listed samples reveals the following classifi-
cations:

TABLE 2: FOCUS ANALYSIS

	Action/ Decision	Passive/ Being
Internal Bank Memos	100%	0%
External Governmental Communiques	100%	0%
Internal Mid-Level Management Communiques	90%	10%
External Audit (10-K) Reports	100%	0%
Direct-Mail Sales Letters	100%	0%
Literary Articles	0%	100%

Obviously, the majority of these memos have an action orientation.

If a written piece must meet both standards 1 and 2 to be classified as technical, then the following categorizations appear:

TABLE 3:: TECHNICAL/NON-TECHNICAL COMMUNIQUES

Technical	Non-Technical
Bank Memos	Governmental Communiques
Internal Management Memos	Direct-Mail Sales Letters
10-K Reports	PMLA Articles

As mentioned earlier, these two standards are not all inclusive. Others need to be added. Political tracts such as Common Sense certainly fall into the Action/Decision model. If they meet the point-of-view ratio should they therefore be categorized as technical?

Likewise, the two standards defined here need further modifications or additions. One deserving consideration, for example, is counting the impera-tive as personal rather than impersonal. When the imperative is counted as impersonal -- as this study does -- a number of detailed, step-by-step manual instructions meet the point-of-view criterion. At the same time, however, some direct-mail materials -- "Stop by today and buy your Sharpo sandwich maker" -- could likewise meet it. Is direct-mail technical writing?

Modifications and additions will come. The important point to realize
for now is that a start at a specific definition has been made. Point-of-
View and Focus Models provide ways to go beyond generalities and abstractions.
They allow a kind of "hands-on look" at the machinery that makes technical
writing work. And as every good mechanic knows, the more familiar one is
with an engine the better he or she can make it work.

NOTES

[1] Gordon H. Mills and John A. Walter, Technical Writing, 4th ed. (New York:
Holt, Rinehart and Winston, 1978), p. 3.

[2] Readings for Technical Writers, ed. Margaret D. Blickle and Martha E.
Passe (New York, 1963), p. 3.

[3] W. Earl Britton, "What Is Technical Writing?" The Practical Craft:
Readings For Business and Technical Writers, ed. W. Keats Sparrow and
Donald H. Cunningham (Boston: Houghton Mifflin, 1978), p. 10.

[4] Jane Walpole, "Why Must the Passive Be Damned?" College Composition
and Communication, 30, no. 3 (October, 1979), p. 251.

[5] Two useful texts on the topic of accounting writing are: Mary C.
Bromage, Writing Audit Reports (New York: McGraw-Hill, 1979) and A. P.
Richardson: The Ethics of a Humanist, ed. Michael T. O'Neill, (New York:
Arno Press, 1980).

[6] The Practical Craft: Readings For Business and Technical Writers contains
interesting discussions of this topic.

[7] Marian E. Musgrave, "Sexual Excess and Deviation," CLA Journal, 22, no. 3,
(March, 1979), p. 234.

Clinical Report Writing: Process and

Perspective

by Helen Rothschild Ewald

In his article "Problems in Communicating Psychological Understanding,"
Fred Shectman, The Meninger Foundation, posits that failures to communicate
often result from inadequate diagnostic assessment.[1]   Significantly, much
of what Shectman classifies as diagnostic assessment implicitly involves
certain phases of the writing process.   What are the similarities between
clinical procedure and writing process procedure.   And what is the importance
of these similarities as they relate to written communication?

I came to these questions as a teacher of writing, not as a clinician.
Yet, the more I taught Clinical Report Writing: 211, the more I realized
the interconnections between clinical procedure and writing process.   In
this paper I will explore the "clinical connection" both as it contains in-
sights into the composing process per se and as it offers a perspective on
our professional opportunities as English teachers in the 1980s.

THE COURSE

First, a word about the course itself seems in order.   Clinical Report
Writing involves report writing in psychology and psychiatry.   It thus at-
tracts students somehow connected with clinical settings; these students
can range from the Head Nurse of the psychiatric wing of a local hospital
to a student working toward a two-year Associate Arts degree with a special-
ty in alcoholism counseling.

The course entails audience/use analysis and features the basic pro-
cedures of information gathering, diagnosis and prognosis.   Commonly, the
clinical report writer must consider a dual audience, consisting of primary
readers who have a direct interest in the client's case and of secondary
readers who may, for example, use the client's case-history as datum for
separate research.   The finished clinical report, therefore, stands as both
a recommendation and a reference for its respective audiences.

The clinical report also represents the end product of a process "by
which the behavior scientist /or prospective clinician/ proceeds from raw
data to inference," a process through which new knowledge is created from
information gathered.[2]   (The report's data or information originates in
"client" interviews.)   Clinical report writing thus involves two inter-
linking processes: the process of creation and the process of communication.

As a communication process, it entails obvious similarities to the composing process of any writer. It involves working with audience, content, form, and style.

It is in the perception of clinical report writing as a creative process that interesting parallels develop between what the practicing or prospective clinician does as he/she deals with a client and what a writer does as he/she deals with a subject. Let's explore some of these parallels.

THE CLINICIAN'S AND THE WRITER'S GENERATIVE PROCEDURE

In describing the process by which clinicians generate new knowledge from raw data, Sarbin, Taft and Bailey write in Clinical Inference and Cognitive Theory of six overlapping stages of inference. These are: 1) possessing a postulate system, 2) constructing the major premise, 3) observing for occurrences, 4) instantiating (classifying) the occurrences, 5) reaching a referential product, and 6) predicting the significance of the inference, then making recommendations.

Of these six, the last five represent areas with clear parallels in generative writing procedure, namely: constructing a tentative controlling generalization, generating information, selecting that information which best supports the tentative generalization or discovering an alternative generalization from within the material, reaching a coherent relationship between the controlling generalization and the supportive information as expressed in a particular arrangement, and drawing up a conclusion.

The above point-for-point parallels in generative procedure suggest a common cognitive base, and support Frank D'Angelo's contention in A Conceptual Theory of Rhetoric that topics of invention reflect comparable conceptual operations, although D'Angelo's emphasis is on rhetorical patterns and not on generative strategies in general.

In any case, the first stage of inference in the clinician's generative procedure, that of possessing a postulate system, warrants further discussion before the overall significance of the similarities between the clinician's and the writer's generative procedures can be established.

The postulate system as a procedural base

When a clinician engages in generative procedure (sometimes termed diagnostic assessment), he or she implicitly invokes a personal postulate system (stage one) as a basis for inference making. This system, whether derived through inductive summation, deductive construction, analogical reasoning, or reference to authorities, forms the assumptive world which influences each of the subsequent five stages of inference mentioned earlier. It, for example, helps the clinician adopt a "focusing principle" which guides the search for relevant information.[3] Such focusing according to a personal postulate system involves asking questions such as: "What is the client in relationship to me?" (hostile, informative), "Who is the client in relationship to me?" (worker, child), "How well does he/she

perform in relationship to my role expectations or valuational system?",
and "Why does he/she perform as he or she does?".

The first two questions represent the types of questions writers ask
in audience analysis; the second two represent those they might ask of their
subjects: "How well does my topic reflect my social and/or ethical beliefs?"
and "Why does the topic seem relevant to me?" What is interesting here is
the essentially egocentric nature of the questioning. For the writer,
the audience becomes important as it relates to the identity of the writer;
similarly, the subject becomes important as it relates to his or her assump-
tive world. Both audience and subject are understood in terms of the writer's
self. Thus, the questioning represents Kinneavy's triangle of self, subject,
and audience with the self involved at all points. In so doing, it does not,
at least in the traditional sense, feature the decentering thought so crucial
by Piaget and others.

Such questioning forces the clinician or the writer to articulate his
or her postulate system. In answering the question, "How well does the clien'
or subject perform in relationship to my assumptions?", for example, both
clinician and writer must explicitly formulate those assumptions so these may
function as a concrete measure of the client and the subject, respectively.

It is possibly no surprise that clinicians undergo extensive self-analy-
sis as part of their training. This analysis essentially defines for the
clinician the set of assumptions which underpins subsequent inference making
during diagnostic assessment. The self-analysis also eventually aids the
clinician in evaluating his or her generative procedure after a "final"
diagnosis has been reached. More on evaluation in a moment.

Writers, on the other hand, are not always forced to examine their as-
sumptions before putting pen to paper. Their unarticulated assumptions
therefore can emerge in their writing as unsupported broad generalizations,
or as faulty causal relationships, or as the perception of the reader as
the writer's clone, with identical understanding and experiences. The writer,
however, needs to understand his assumptive world as being egocentric.
The writer needs to realize that he or she does project a set of values on
the audience and the subject. And the writer needs to evaluate these values,
as well as the product informed by them.

These questions thus present themselves: Would student writers benefit
from self-analysis before composing? Should writers be required to articu-
late their postulate system as a "pre-writing" strategy? Indeed, could
these writers produce a clear picture of their assumptive world if asked
to do so?

The overall procedural model

So far we have seen that each of the six stages of a clinician's gen-
erative procedure (including possessing a postulate system) offers compari-
sons to each of a writer's. If each of the six stages of clinical inference
finds parallels in generative writing strategies, so too does the nature of

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the clinical procedure as a whole offer comparisons to generative writing procedure. Let's focus on two such comparisons.

First, Sarbin, Taft, and Bailey argue against an intuitive model of diagnostic assessment or inference. They maintain that just because certain clinical interpretations which seem to emerge "out of the blue" can later be confirmed does not mean that "labels which suggest a process akin to revelation or intuition" are appropriate.[4] Interpretive acts, they claim, have a natural history of pre-existing premises which, although implicit, strongly influence inference making. In other words, such premises, whether possessed as part of the clinician's initial postulate system or acquired as a "supplement" to that system during the client interview, predict "discoveries" made during diagnostic assessment.

Can the same be said of those moments of inspiration or insight a writer may experience? Are discoveries in writing necessarily anticipated by a writer's assumptions or by pre-existing clues in the information gathered or in the drafts attempted or even in the writer's past composing experience?

Traditionally, educators in general and English teachers in particular have been associated with the intuitive rather than the empirical.[5] English teachers themselves are loathe to deny the intuitional in writing.[6] Yet, crosscurrents exist which would put insights in writing on more analytical ground.

In "The Psychology of Language and the Teaching of English," Robert de Beaugrande maintains that good writing is not so much inventive as recombinational.[7] Indeed, for good writers, these recombinations may seem spontaneous: "This paper just seemed to come alive and write itself." However, as Donald Murray suggests, perhaps good writers are constantly in a state of rehearsal. This rehearsal serves as a well-spring of creative clues or, to use a clinician's perspective, as a set of pre-existing premises, which quite naturally, even logically, elicits new combinations or discovery in writing.

What cognitive theorists state, in fact, is that inference itself is "the cognitive transformation of one set of events through another set of events which produces new knowledge about the first."[8] Their perception of inference here as involving a Hegelian thesis/antithesis/synthesis framework bears resemblance to Kenneth Burke's concept of identification as "exploring the terminological limits of opposing positions and searching out the term at a higher level of abstraction which will allow opposing views to be reconciled."[9]

In any case, new knowledge or synthesis is achieved as a natural, rather than as an intuitive or mystical end to clinical and writing procedures. And, as such, the act of discovering this new knowledge can be seen as something which can be taught and/or learned.

Second, cognitive theorists note that variations or miscues in inferences

as end products stem from various sources, including personal error, varying contexts, and differing interaction between clinicia.s and client. Whatever the cause of inferential error, clinicians discuss and evaluate inferential miscues by using each of the six stages of the inference process as "focal points."[10] In other words, to evaluate inferences as products, the clinician examines, step by step, the process which generated the inference

Does such evaluation of the product in terms of the process have application in writing? Should a writer, or a teacher of writing for that matter, evaluate the final draft in terms of the procedure which produced it? To be sure, much has been made of the process/product distinction in writing. "Teach writing as process, not product" has become a bromide for composition teachers. Yet, the corollary "Evaluate writing as process, not product" is not commonly expressed. A notable exception to this dearth can be found in the work by Kroll and Shafer on error-analysis, a process-based approach to errors made by ESL students. Here, errors are seen as "windows into the mind" and as useful to both teacher and student.[11]

Admittedly, such a cognitively oriented perspective on error requires informed sensitivity. Indeed, how can the teacher gain access to the student's generative strategies, to the questions the student finds crucial while composing, to the process effecting the product? And how can the writer examine his or her product as process?

Que.. .ions raised

The above examination of clinical procedure has introduced three primary questions which should receive more attention from the composition teacher: Would students benefit from self-examination as a pre-writing strategy? Is discovery in composing a natural outgrowth of pre-existing contexts? And can a finished piece of writing be evaluated as process?

Let's assume, for the moment, that the answer to each of these questions is affirmative. What methodological implications ensue?

1. Before beginning to write, a student should be asked to articulate, as best as he o' she can, the assumptions which inform his or her world view. At the beginning of the term, for example, a student could be asked to re-:rd statements which he or she believes are true. With each paper, the student could then be asked to relate one or more of these assumptions to the controlling generalization of each piece, and to note down any additions or revisions of these beliefs as they occur during the term. In so doing, the student would be working to understand his or her postulate system as it existed at any given moment.

2. A student should be asked to enrich his or her contexts for writing. Granted, it is not possible to tell a student, "Go out and live in the world a few more years and then come back to composing," or "Go out and read one-hundred books and write a dozen or so themes before returning to this class." It is possible, however, to construct occasions which encourage

discovery or synthesis. For instance, a student could be asked to pose both a tentative generalization and an alternative generalization governing a single topic.   Then the student could be asked to reconcile the two generalizations with a final thesis which could be specifically supported. Christine Barabas' work with idea combining also has currency here.[12] In essence, the student here would be working to enrich his or her postulate system.

3. A student's final paper should be evaluated as process as well as product. A student, for example, could be asked to write down the questions which he or she found crucial in composing the paper, and to submit all such prep-work with the final draft. In addition, evaluative conferences could, in part, focus on the student's orally recalling how he or she reached the end product as submitted. In fact, recent literature on problem solving supports the idea that telling a person how people do do something is much less effective than telling that person how to do it.[13] In other words, telling a student how you have solved the problem in his or her text, or how peers may have solved a similar problem, is less effective than reviewing the process involved in reaching a particular solution or draft. If the student's product is flawed, the student's method for reaching that product should be examined. The student would thus be gaining insight into generative procedure as a whole.

The suggestions above are tentative. Certainly, additional research, into how the clinician proceeds while making and evaluating inferences for instance, may well generate further pedagogical approaches.

A CONSULTATIVE ALLIANCE

This paper has suggested how writers, and teachers of writing, might benefit from understanding clinical procedure. This significance of the "clinical connection" involves more than a one-way street, however. Clinicians themselves are expressing interest in the benefits that interdisciplinary study and cooperation can bring. Shectman's call for a "consultative alliance" that is "as essential for non-clinicians and their crucible of involvement as for diagnosticians and their patients"[14] embodies, I believe, a challenge to professionals to expand their "crucible of involvement" to include those insights into communication which various fields can provide.

Past work in educational psychology and recent work in such areas as the cognition of discovery or hemispheric brain functions show that the "clinical connection" has already been recognized by educators in general and English teachers in particular as one worth pursuing. Moreover, scientist Frederick Reif has just proposed intensive research into the domain of "human cognitive engineering" which would deal with prescriptive aspects of human information processing and would bridge the "gap" between the approaches of cognitive scientists and educators.[15]

At this point, I too would like to suggest briefly yet another area for potential collaboration: neurometrics.

"Many data show that brain electrical activity reflects subtle aspects of brain functions including information processing and cognition."[16] Neurometrics is a means of measuring that activity.

Neurometrics was originally used for diagnostic assessment of learning disabilities to determine whether the disability had a physical rather than an environmental or emotional base. More recently, it is being touted as a means of measuring intelligence, especially verbal intelligence.[17] In the future, I would submit, neurometrics could be used to measure the effects of certain materials or methodologies in teaching skills involved in information processing. As such, it could be a valuable tool for those of us teaching writing, a skill which surely entails information processing at core level.

The pedagogical applications of neurometrics are not yet known for a surety. It will take both the clinician and the educator working together to form a diagnostic assessment of neurometrics as a pedagogical aid.

NOTES

[1] Fred Shectman, "Problems in Communicating Psychological Understanding," American Psychologist, 34 (September 1979), 782.

[2] Theodore R. Sarbin, Ronald Taft, and Daniel Bailey, Clinical Inference and Cognitive Theory (New York: Holt, Rinehart and Winston, Inc., 1960), pp. 3, 44.

[3] Clinical Inference and Cognitive Theory, pp. 145 ff.

[4] Clinical Inference and Cognitive Theory, p. 81.

[5] Frederick Reif, "Theoretical and Educational Concerns with Problem Solving: Bridging the Gaps with Human Cognitive Engineering," Problem Solving and Education: Issues in Teaching and Research, eds. D. T. Tuma and R. Reif (Hillsdale, N.J.: Lawrence Erlbam Associates, 1980), p. 42.

[6] See Sabina Thorne Johnson's discussion in "The Ant and the Grasshopper: Some Reflections on Prewriting," College English, 43 (March 1981), 236 ff.

[7] Robert de Beaugrande, "The Psychology of Language and the Teaching of English," A paper presented at the Annual Meeting of the Conference on College Composition and Communication (Minneapolis, Minn., April 4-7, 1979).

[8] Clinical Inference and Cognitive Theory, p. 45.

[9] See Virginia Underwood, Unpublished Dissertation, Florida State University, 1930, p. 185.

[10] Clinical Inference and Cognitive Theory, p. 223.

[11] Barry M. Kroll and John C. Shafer, "Error-Analysis and the Teaching of Composition," College Composition and Communication, 29 (October 1978), 243 ff.

[12] Christine Barabas, "Idea Combining: Syntnesizing Syntax and Meaning," A paper presented at the Annual Meeting of the Conference on College Composition and Communication (Washington, D.C., 1980).

[13] Michael Scriven, "Prescriptive and Descriptive Approaches to Problem Solving," Problem Solving and Education: Issues in Teaching and Research, eds. D. T. Tuma and F. Reif (Hillsdale, N.J.: Lawrence Erlbam Associates, 1980), pp. 135 ff.

[14] Shectman, p. 790.

[15] Reif, p. 42.

[16]E. Roy John, et. al. "Neurometrics," Science, 96 (24 June 1977), 1393.

[17]Berkeley Rice, "Brave New World of Intelligence Testing," Psychology Today, 13 (September 1979), 26-41.

PREPARING FOR AN INFLUX OF FOREIGN STUDENTS IN TECHNICAL WRITING COURSES: UNDERSTANDING THEIR BACKGROUND

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One of the sureties facing technical writing and report writing teachers of the 1980s is that as enrollments of American students decline in our universities, the universities will enroll more and more foreign students, and these tend to congregate in technical and professional fields. In my own school, Syracuse University, nearly 20% of the 1100 engineering students are now foreign; in the fall of 1976, only 9% of the freshman engineering class was foreign. This represents a dramatic increase, and all signs indicate the percentage will rise still further. Our school is no exception. It's safe to say that all of us teachers of technical and report and professional writing will increasingly find ourselves with a new type of student body: foreign students who have mastered enough grammar to move out of basic grammatically focussed English as a Second Language courses, into regular courses often required by the student's professional field. Or the student may come on his own to take technical or business writing-- to improve his written work so he can eventually communicate effectively with Americans and with American companies. The theory has in the past been that once these students pass the Michigan ESL exams, they have grammar reasonably in hand, and they can go into regular writing courses. In practice, things aren't so simple.

The technical writing field has so far done little to prepare its teachers for this phenomenon. The English as a Second Language Field too has on the whole been busy elsewhere: with the more severe problems of incoming students rather than the more subtle difficulties of the more advanced students. Even most of the specialized EST (English for Science and Technology) or ESP (English for Special Purposes) subgroups of ESL focus on the low-level problems of the students in vocabulary acquisition for scientific or technical or business writing and in grammatical control. Very little attention is given by the ESL field to the advanced foreign student whose problems are beyond the grammar and vocabulary level (though these difficulties never disappear as hindrances). The business communications field has been admirably active in researching and studying and teaching the special problems that arise in intercultural business interactions. But even here, questions of prose and writing tend to take second place to

questions of behavior and attitude.

Thus most writing teachers will face this inevitable crop of foreign students with virtually no preparation for the special problems that arise. Since I myself have already been facing the situation, I feel that others can certainly benefit from my investigations to seek guidance in the literature to understand the particular problems of these students. Specifically, I would like today to examine the cultural and historical influences that students from foreign countries will bring with them to our technical and report writing classes, in particular those influences that would affect their receipt of instruction in American principles for written prose. I am on the whole not concerned with the level of grammar; that ground has been well covered. We are seeing students with reasonable grammatical control but with more sophisticated levels of difficulty and with more diverse needs in conforming to our writing precepts.

I am particularly interested in the larger aspects of prose, not the linguistic units in individual sentences, but in the grouping of sentences into idea units and into paragraphs, and the grouping of the paragraphs into whole structures. I am interested in the different cultures' different habits and norms for handling prose, and the dictates for style and structure and sufficiency and approach. This is an area that the technical writing field has paid no attention to, the business communications field has paid little attention to, and ESL researchers have seldom gone beyond sentence and paragraph-level investigations.

My work on this project has involved two stages. One is to examine modern technical and business reports written in the different cultures. This particular stage I do not yet consider complete. The other stage has been a search of scholarship in linguistics, ESL, communications, anthropology, sociology, psychology, psychiatry, literary criticism, and many other areas involving in-depth examination of a culture and its language, and the relation between the two. Thus I will today compile and interpret the observations and analyses and conclusions of the critics in these areas, and add some of my own. I would hope to interest more people to this area of study, to help understand and solve the writing adjustment difficulties of our foreign students.

Due to the constraints of time here, I will confine myself to students from two types of backgrounds that we are likely to see more of in future: (1) the middle eastern or Arab student, and (2) the far eastern or Japanese student. One of the foundations of intercultural communication study is Edward Hall's valuable cultural designation system, presented in his 1976 book Beyond Culture[1]. Here the Arab and Japanese cultures are termed high context, low-logic cultures. Our American society, on the other hand, is a low-context, high-logic system. Hall's is an enormously valuable approach to understanding a culture and its communication tendencies.

For those unfamiliar with Hall's work, I'd like to look at this a little

further. Our western culture is classified as low-context, meaning we are so mo ile and diverse in population that very little coded information is contained in the culture itself; each piece of writing must carry all of the needed codes and information within it. On the other hand, the middle eastern and far eastern cultures are much more uniform, characterized by greater similarities in background among those communicating with one another within the culture. Thus the writer in these cultures can assume much coded understanding in the reader, and the writing needn't stand on its own. In neither the mideastern or far eastern cultures is logic highly valued, as it is with us. Prose development in these cultures operates by other principles.

Hall's approach is thus useful for categorizing these extremes, but it has severe limitations in helping us to distinguish among the different codes and cultures at either of the extremes, and to account for the enormous differences we see in the writing of Arabs and Japanese, for instance--both high-context and low-logic.

What then are the differences in the writing of these cultures that another theory will have to account for? Let's look at the Arab student first. Where technical reporting is concerned, we're trying to see in these students a reverence for precision, accuracy, facts, ideas, and objective reality. Yet my research shows the Arab culture historically reveres emotional appeals and reveres words. This love of language rather than ideas and the Arabic dependence on emotional appeal and on rhythmic almost musical effects of language have rather pronounced consequences on the Arabic students' use of language. Raphael Patai, in a book entitled The Arab Mind points out that the Arabic noun balagha (eloquence) is derived from a variant f the verb which means to attain male maturity [2, p. 49]. States Patai, "eloquence is, thus, to the Arab an achievement akin to the attainment of masculinity." But note that "from the same verbal root is derived the noun mubalagha, which means verbal exaggeration or hyperbole. To the Arab mind, eloquence is related to exaggeration (p. 49)".

There's no doubt that our Arab writing students at SU have shown exactly these tendencies. Many overassert, overstate, overgeneralize, and often veer from objectivity. Their prose is frequently ornate and wordy; simplicity of diction and brevity do not come naturally to them. These students have met lower-class requirements before we see them, but the tendencies persist.

E. Shouby, a native Arabic-speaking psychologist with training in both clinical and social psychology, points out the persistent nature of the problem in a now classic 1951 article[3]. He points out that Arabs have in their culture been habituated and even forced to overassert and exaggerate in all types of communication if they wished to be sure of not being misunderstood. Terry Prothro, in a more careful and less biased study than Shouby's, tested and verified Shouby's observations[4]. He found that

Arab students had totally different reactions to and perceptions about the language used than did American students tested. Statements which seemed to the Americans strongly favorable or unfavorable seemed to the Arabs to be merely neutral. Statements that were taken by the Arabs as mere statements of fact were taken by the Americans to be extreme or violent assertions. Firm assertions to the Americans seemed weak and doubtful to the Arabs. Though 'rothro's study dates to 1955, we are still at SU seeing many Arab students in technical or report writing classes with just these tendencies.

What does this style and cognition difference mean to us as technical and report writing teachers? If we are to have any hope of ourselves communicating with our Arab students and of teaching them to communicate in our culture, we at the least have to understand the problems the cultural background brings to their writing. We must understand that in the course of learning to speak, Arab children acquire not only the rich Arabic vocabulary and the grammar, but also the style, including specific devices such as exaggeration and overassertion. Use of these devices becomes, and remains, as natural to the Arab as his use of vocabulary and grammar. When a student uses exaggeration and overstatement, he is often not at all or only barely aware of employing these specific devices. We have to help him so that in his mind, exaggerated statements will register as such.

To move from style, what special problems does our Arab student bring to organizing or structuring units of information? Professor P. Cachia gives an analysis common in my examination of scholarship on the Arabic language and literature. Cachia writes that no literary form arose in Arabic literature demanding a sustained and unified development and inspiration[5, p. 346]. The reader and writer both approached literature and writing as a collection of fragments, rather than as a whole. Similarly, Arabic music and decorative art consist of repetition of one or more units, without the necessity for a definite feeling of a whole, for a recognizable beginning or ending. Professor Eli Salem echoes this[6]. He writes that Arabic prose is characterized by repetition and consists of isolated units with little or no transition or connection. (See the KORAN for a good example of this type of writing).

Jacques Bercque in his book Cultural Expressions in Arab Society Today [7] finds logic in the lack of logic of Arab writing, symbolic value in the fact that Arab writing often encompasses a series of apparently unconnected themes and parts. According to him, that's the way the Arabs perceived the world as being, and so in the jargon of structuralist criticism, the writing (the signifier) then becomes the signified. This is a quite different explanation of the phenomenon we observe than is Hall's high-context answer, but either explanation leaves our Arab students with the same heritage in prose cohesion, quite different from ours.

Bercque, writing in the 1970s, acknowledges that since 1950, contemporary

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Arab writers have been reacting to the western discomfort with the lack of structure and logical continuity in Arab writing, and attempting to follow western precepts. Obviously we have to acknowledge that many Arabs have now successfully adopted western forms and western norms. But although the physiognomy of much Arab prose now looks more familiar to us, the conflicting tendencies are often still very strong. The tension in the cultural paradigms is still present in the background of many Arab students. At SU, we still see severe problems in connection and unity of prose of a quite different order than in American students. Also repetition for emphasis is commonly used far more by them than western codes find suitable. (Robert Kaplan from USC has also found significant differences in the prose movement within paragraphs between Arab students and American students[8]).

Another question of structure and expectation is what is felt necessary to cover for a specific type of writing assignment. In my own experience with students, I have found the Arab students to frequently include material that would not here be considered relevant for that writing task for that audience and purpose. The additional material is quite consistent in pattern, and, I find, consistent with the experience of others. Hall, creator of the logic and context classification of cultures already referred to, in another classic book on intercultural communication, The Silent Language, reinforces my observation: "The Arab looks back two to six thousand years for his own origins. History is used as the basis for almost any modern action. The chances are that an Arab won't start a talk or a speech or analyze a problem without first developing the historical aspects of his subject" [9, p. 147]. So, I will typically see first drafts of five-page papers on current progress with three pages devoted to a history of the problem or situation, all of which falls outside of the reporting period of the progress report. I find this happening not only in Arab student writing, but professionally, in progress reports of midest Nuclear Research Centers, for example.

What about the Japanese student? According to Hall's system, he too is from a high-context, low-logic culture, as is the Arab. And yet the Arab student's writing tendencies are entirely different from the writing adjustment difficulties we see in the Japanese student. Whereas the Arab culture puts a high value on language and on eloquence and on emotion, the Japanese student's heritage is just the opposite. A Japanese student's report is likely to be understated, rather ambiguous, and often extremely apologetic. We frequently can't quite make out if agreement or disagreement is being conveyed. The report may read much like a tight ambiguous haiku poem.

International communication specialists have oft commented on the ambiguity of the Japanese use of language. With an extraordinary degree of similarity in the background of its citizens, Japan has had a shared understanding that eliminated the need for precise wording to communicate meaning. Japan is such a crowded hierarchical society that the Japanese

have developed as a virtue to live and let live, to reveal little in language, and thus to avoid offending anyone by a statement disagreeing with his own. The precision and clarity we revere are not at all desirable in Japan.

In fact, effective language use is not held in high esteem. Nor are the Japanese criteria for fulfilling communication purposes by prose development the same as ours. According to Eiichiro Ishida in Japanese Culture [10, p. 117], an orator seeking to appeal by persuasive logical argument or by eloquence is still considered contemptible in Japan. The response will be much better if both sides of the issue are presented and given due attention and credit. And Japanese organization patterns and paradigms differ from the western ones. In Ways of Thinking of Eastern Peoples, Hajime Nakamura notes that digressions are common in Japanese prose and the movement of the prose spirals, rather than heading in a straight, well defined direction [11, xii]. The Japanese students, as the Arabs, will come to us preferring a loose repetitive structure, but instead of over-statement or stylistic embellishment, they resort to suggestion and under-statement. As Edwin Reischauer from Harvard puts it so aptly, "the Japanese do a great deal of beating around the verbal bush" [12, p. 386]. Their respect for the feelings of others and the resulting desire for social harmony I feel have led to a style of language use that constantly probes and hints, suggests by indirection and vague implication, but does not state positions sharply or move directly.

Much more can be said, but time is short. Let me conclude by pointing out that the existence of a meaningful correlation between culture and language was recognized as early as the 19th century by Von Humbolt and popularized in 1929 by Edward Sapir, the linguist. Despite objections that the cultural approaches deny the creative aspects of language use by focusing on the normative aspects, in general recent research in cultural anthropology, linguistic anthropology, sociolinguistics etc has been proving the validity of a close relationship between language use and culture. With our expected influx of foreign students, we as technical and report writing teachers should make ourselves more familiar with the work in these cultural-linguistic fields, to prepare ourselves for our changing student body. I hope more of us will apply ourselves to isolating and identifying the prose handling problems, and to finding ways to ease them for these students.

We should certainly seek the help of personnel trained in these areas at our universities, to develop special sections of technical or business writing, or at least to develop special components of regular sections to focus on cohesion, logic, context requirements, style etc for the needs of these special students. Students from cultures whose logic and context and thus prose heritages are so different from ours as are the Arab and Japanese heritages will need a great deal of attention to be able to produce prose competently according to our norms. But my research shows that even

students at our end of the logic-context scale, such as French and German
students, have significant difficulties in handling our prose and reporting
demands. Their difficulties are not always as blatant, but nonetheless
still troubling and extremely interesting. This is definitely an area that
deserves much more attention.

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ENLIGHTENED USE OF THE PASSIVE VOICE IN TECHNICAL WRITING

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Pick up virtually any technical or scientific writing text published during the past ten years, check the index for "passive" or "voice," turn to the pages to which you are thereby referred, and what will you find? Sternness, censures, and caveats--all directed against the use of the passive voice. You will find qualifiers like "lifeless," "wordy," "unnatural," "indirect," "pompous," "impersonal," "unclear," and "inappropriate" applied to the passive. If you are a technical writing student, you will assume that the fewer passives you use, the better your chances for earning an "A" in the course. I feel these textbook jeremiads on the passive voice are misleading students.

To be fair, I must point out that the authors of some contemporary scientific writing texts admit the passive can "sometimes" be "useful."[1] John Brogan even feels that "the passive voice is indispensible for a flexible style."[2] But always the warning follows: "Use the passive, but use it sparingly."[3]

The technical text authors give the impression that, if the passive is necessary, it is a necessary evil. Normally, they treat the passive under a heading like "Common Technical Writing Errors," along with tense shifts and tautologies.[4] Sentences with passive verbs are denominated "problem sentences,"[5] and students are asked to provide "correct revisions" for the offending forms. Under the heading "Active Verbs," one author even makes the suggestion that a passive sentence is one in which "the finite verb does not function properly."[6] Steven Pauley's instructions summarize the sentiments of most current technical text writers concerning the passive:

> Whenever possible, use the active verbs for descriptions of operations and for most other kinds of technical writing.[7]

Robert Day uses even stronger rhetoric in How to Write and Publish a Scientific Paper. Labeling the use of the passive in scientific writing a "bad habit," he appeals:

> I herewith ask all young scientists to renounce the false modesty of previous generations of scientists. Do not be afraid to name the agent of the action in a sentence, even when it is "I" or "we."[8]

Day's reference to "generations" of scientific-users is historically accurate. Generations--in fact, centuries--of technical writers have found that the passive voice was specially suitable for their subject matter and profesional objectivity. Of course, they have not used the passive exclusively, but in ratios ranging between 1:5 and 1:3 (passive to active).[9] As early as the

seventeenth century, Sir Frances Bacon (who might well be thought of as the father of English technical writing) used the passive without compunction. Of the 61 finite verbs in his "Essay 10, Of Love," for instance, 12 are passive and 49 active, roughly a 1:5 ratio.[10] As recently as 1966, Svartvik found a 1:3 passive-active ratio in a "scientific exposition" identified as typical of its genre in terms of voice distribution. This voice ratio contrasts sharply with those of two novel texts Svartvik examined, where passives averaged only 6% of the total finite verb count, yielding an active-passive ratio close to 1:17.[11]

Have stylists always complained about the scientific predilection for the passive? No. As a matter of fact, one author who decries the passive in his 1980 technical writing text wrote not a word on the subject in his 1958 text. But his practice belies his words in the 1980 text, where his examples and his own prose feature the passive prominently, in ratios as high as 2:1 (passive-active) on selected pages.[12]

During this century, the scholarly winds have shifted 180 degrees on the use of the passive in technical writing. T. A. Rickard used the passive freely in his 1931 text, Technical Writing. Although voice is nowhere discussed as such in the work, Rickard's corrections of "verbose and confused" passages show his own clear preference for the passive as the more direct and professional-sounding voice. Passive verbs he almost invariably leaves alone in his revisions, and active verbs he frequently converts to passive.[13] In 1962, David Comer and Ralph Spillman were still recommending the passive as a means of producing the "completely impersonal language style" most appropriate for technical writing.[14] Even in 1965, W. Paul Jones (then in the seventh edition of his Writing Scientific Papers and Reports) was maintaining that the third person passive was the preferable point of view for scientific writing, "mainly because it emphasizes the action and the thing done and minimizes the importance of the 'oer." But he apparently felt the winds shifting and so qualified his stand by commenting that the passive is "devoid of human interest and color" and that the third person active "may" be suitable for process descriptions.[15]

During the late 1960's, the academic weathercocks turned and the passive became unfashionable. The passive has always had its critics, of course, usually purists who have regarded it as abnormal. Many linguists objected to the introduction of the passive progressive in the eighteenth century, for instance. But their oratory was anachronistic. The populace had long since innovated, approved, and adopted the form into colloquial usage.[16] As Svartvik indicated in 1965, a dichotomy still exists between the passivists and the anti-passivists (the terms are mine), between those who see the passive as a significant and natural construction and those who feel "the only reason for keeping the category 'passive' is that it has come down to us as part of our classical grammatical heritage."[17] The most frequently quoted modern anti-passivists are Strunk and White in The Elements of Style (1959).[18] Their advice on the matter is simple and pungent: "Use the active voice."[18]

However, current practice (not theory) in technical writing, together with a solid body of evidence and theory compiled by the most recent syntactical researchers, all urge that the passive is viable and suitable for this genre of writing. There is no indication that the passive will or should supplant the active in technical writing. But neither is there any evidence that the passive

will or should be eradicated from the genre. The few reasons advanced in recent technical writing texts for banishing the passive are all essentially mythic and could, in many cases, be turned against the active as well as the passive. The bias of the textbook authors is nowhere clearer than in the examples they choose to demonstrate the impracticality of the form. It would be rather easy to come up with equally tendentious examples to prove another preposterous theory--that the active voice ought to be extirpated from technical literature.

Ironically, these very authors provide a convincing case in favor of preserving the passive voice, at least in technical writing. Why? Because they themselves use it repeatedly--not only in their texts proper but also (this is positively comic in some cases!) in their models. Joseph Williams regaled CCC readers just last month with selections from George Orwell and (more important for this study) from S. J. Reisman in A Style Manual for Technical Writers, violating their own dictums against the passive, and doing so "in the very act of criticising the passive."[19] The citation from Reisman is splendidly self-contradictory:

Emphasis is often achieved by the use of verbs rather than nouns formed from them, and by the use of verbs in the active rather than in the passive voice.[20]

Other anti-passivists have slipped into the passive while proscribing it. Objecting to "could be heard," Strunk and White use "can be made":

Many a tame sentence of description or exposition can be made lively and emphatic by substituting a transitive in the active voice for some such perfunctory expression as there is, or could be heard.[21]

Day, too, catches himself in his own trap:

The passive voice could be avoided by saying "The authors found" instead of "it was found."[22]

Space simply will not permit me to rehearse all the passives that occur and recur in technical writing models constructed by the anti-passivists. However, the following instances are typical. In a 24-page model report entitled "The Feasibility of Removing Sediment and Muck from Wyoming Lake," Houp and Pearsall use the finite passive at least once on every page (except those pages with no finite verbs), in passive-active ratios ranging from 1:7 to 2:1. The average passive-active ratio in this 1980 model is a little better than 1:3, roughly the same ratio Svartvik found in a typical scientific text 16 years ago.[23] An even more startling passive-active ratio (7:12!) can be found in model sentences Day provides on the page just opposite his assertion that the passive is a "bad habit." Certainly the passive is a habit--one Day (to his credit) has not yet shed.[24]

Of the current myths concerning the passive, some are intertwined. Such is the case with these three erroneous notions: (1) that the passive utilizes an abnormal and artificial word order, (2) that the passive is lifeless, and (3) that the passive is indirect. Fear, for example, combines the three issues into

a single line of argument. He asserts the passive "reverses the normal ⌐¹ ⌐ of a sentence" and is therefore "less direct than the active patterns it substitutes for." "Don't overdo the passive," he concludes, "or you'll risk sounding lifeless and stuffy."[25] Expanding on the passive's lifelessness, Pauley argues:

> When a sentence is in the active voice, the subject does something. If the sentence is in passive voice, the subject does nothing; instead of acting, the subject is acted on.[26]

Actually, the passive is a long-established, fully normal syntactic form. It is well represented even in the first systematic English grammars. John Fell's grammar of 1784 includes not only complete conjugations of all the passive tenses (except the progressive) but also the "Infinitive Mode" and participia passives.[27] And as early as 1731, in Duncan Daniel's A New English Grammar, an astounding thrust is made at defining the agentless or intransitive passive, a form not precisely identified until this century:

> Of Neuter Verbs, some are Neuter-Actives, and take the Verb I have for their Auxiliary; as I have dwelt, I have run &c. Some are Neuter-Passives; and these take the Verb I am for their Auxiliary. Ex. I am gone; He is ascended.[28]

If the passive form needed further legitimizing, it was Chomsky who completed the process by establishing the essential equivalency of a transitive, active sentence with "its passive counterpart."[29] For Chomsky, the active-passive relationship epitomizes and provides the model for the transformational process which lies at the heart of his generative grammar. He demonstrates the following two sentences to be "cognitively synonymous," one being the natural by-product of the other:

> (i) I expected a specialist to examine John.
> (ii) I expected John to be examined by a specialist.

He then goes on to prove that, in terms of their "underlying deep structures," the two sentences are "essentially the same":

> (i) Noun Phrase -- Verb -- Sentence
>   (I -- expected -- a specialist will examine John)
> (ii) Noun Phrase -- Verb -- Sentence
>   (I -- expected -- a specialist will examine John)[30]

In terms of their "acceptability" (Chomsky's label for "utterances that are perfectly natural and immediately comprehensible"[31]), the two sentences are equivalent as well. To put it another way, the "passivization" of sentence (ii)[32] in no way makes it less acceptable than (i), according to Chomsky's scheme.

If the passive is a normal and acceptable form, why does it sound awkward and abnormal in some of the examples given in the anti-passivist texts? Because their authors have chosen contexts in which the passive is, for one reason or another, infeasible. Look, for instance, at an active sentence Strunk and White offer in their discussion of the passive:

I shall always remember my first visit to Boston.

Naturally, this sentence "is much better than" its horrendous passive conversions:

My first visit to Boston will always be remembered by me.

My first trip to Boston will always be remembered.[33]

Svartvik explains exactly why this sort of inversion fails:

A general difficulty with using transformations of sentences in context is the imbalance that may result. It may be caused by discrepancies in the lengths of clause elements, such as personal pronouns and other short exponents occurring with long subject exponents. We have found that agents are generally heavier than subjects.[34] Pronouns are very frequent as subjects but extremely rare as agents.

In the first of Strunk's passive versions, he uses the "very rare" (and very awkward) pronoun agent Svartvik warns against. The second passive version, of course, is agentless in a context that simply demands definition of who did the remembering.

Svartvik uncovers other conditions within which the passive conversion is impracticable. What he calls "restrictions" on the passive forms of such verbs as "have, lack; contain, hold; become, fit, suit; mean, resemble; befall; cost, last, take, walk, weigh" keep them from making acceptable passives. "She has a fine job," for example, does not convert well into "A fine job is had by her." Nor does "Disaster befell the building project" translate well into "The building project was befallen by disaster." Also, Svartvik gives examples of some contexts within which "prepositional verbs" cannot convert into the passive. "The conclusion was arrived at" sounds fine; "The town was arrived at" does not.[34] Therefore, whenever an active sentence presents one of the conditions outlined above--(1) a short nominal or pronominal subject or (2) a verb with restrictions on its passive use--the passive version will be unattractive, if not incoherent. Obviously, textbook examples drawn from these categories are biased and cannot possibly show the potential of the passive.

Nearly all the anti-passivist texts perpetuate a myth that the passive is always wordy. Only in some cases is this true. One cannot argue with Day's observation that "S. aureus produced lactate" is shorter than "Lactate was produced by S. aureus." Yet what if the agent "S. aureus" is unimportant? Or what if "S. aureus" has already been mentioned, or should not be mentioned yet? Then "Lactate was produced" will be briefer (Note that the passive's "was" is six letter spaces shorter than "S. aureus"). In their study of voice, Gordon Mills and John Walter offer another context in which the agentless passive is more economical and specific than its active counterparts:

Discussion at the meeting of the Board of Directors clearly revealed the weakness of plan X. Plan Y was adopted.

They go on to comment:

The second of these two sentences is passive, yet it seems to do very well. You could write, "They adopted plan Y" but it's no shorter, and the referent of "they" is disturbingly vague. "The Board adopted plan Y" is still one word longer than the original and perhaps you will feel that the repetition of "the Board" is slightly unpleasant.[36]

The charge of wordiness can, thus, be turned against the active, for in cases where it is feasible to drop the agent, the passive is usually the more efficient construction. Further, elimination of the animate agent can often handily eliminate the difficult choices connected with generic pronoun use, now that exclusive use of "he" is considered sexist.

What about the myth that the passive presents tonal problems--that it is pulseless and impersonal because it can eliminate the actor/agent? Here the anti-passivists have confused matters by embroiling the passive in an unrelated debate over point of view in technical writing. The old guard feels the scientific point of view should be strictly impersonal and that the pronouns "I" and "you" should almost never be used. Reflecting this opinion, Comer and Spillman have these instructions for the technical writer:

He has but to remember that he is talking to no one; that he is talking about a subject and the things that concern that subject; and that the talker himself never comes upon the stage.[37]

The newer (but not necessarily prevalent) trend in technical literature is toward a more personal style which features an onstage experimenter/technician (usually "I" or "we") as well as a reader who looks on from the wings (often as "you"). The passive voice was historically the standard vehicle by which the old guard eliminated the experimenter/technician from impersonal writing. "I dipped the litmus" normally became "The litmus was dipped." Unfortunately, however, the passive somehow became actually synonymous with impersonal writing, so far as the composition texts of the 1970's were concerned. In nearly all these books, the passive and the impersonal style are treated jointly or consecutively. But it is irrational and short-sighted to vilify the passive simply because of its long association with the impersonal style. Ironically, the new onstage experimenter/technician will be as dependent on the passive as his/her off-stage predecessor, if the "I/me" syndrome is to be avoided.

The remaining myths about use of the passive in technical writing amount to fears that the construction will somehow lead to other, graver errors--such as dangling modifiers and fogginess. Yet to maintain that one ought not to use the passive because the effort might result in a dangling modifier is like forbidding students to begin sentences with "because" for fear they might write a fragment. One of the texts seriously argues that "passive voice does, indeed, cause many dangling participles" and gives the following as a prime instance of the problem:

While conducting these experiments, the chickens were seen to panic every time a hawk flew over.[38]

A writer who would construct such a sentence needs an emergency lesson in modifier placement, not a discussion on the passive voice.

The argument that the passive is ambiguous or vague is just as easily dispensed with. This criticism rests on two false assumptions: (1) that the passive will always be used without an agent, and (2) that the reader will always need to know who the agent is. An excerpt from the Council of Biology Editors Style Manual summarizes this line of reasoning:

"I discovered" is shorter and less likely to be ambiguous than "it was discovered." When you write "Experiments were conducted," the reader cannot tell whether you or some other scientist conducted them.[39]

The editors underestimate the good sense of both writers and readers. No scientific writer would use the agentless passive in this instance without clarifying in advance just who the experimenter is, if that information is indeed important in the context. And no reader needs to be reminded in every single sentence who the experimenter is.

What is saliently missing in the treatment of voice by recent technical writing textbook authors is, first, a complete and realistic view of the passive's potential. Comments in these books are almost always limited to agentful passives with the "be" auxiliary alone and to finite verbs. But Svartvik's excellent study establishes that the term "passive" should be "used in a very wide sense" as "verb combinations of be (or auxiliaries commutable with be) and a past participle."[40] "Can," "may," "could," "have to," "should," and "get" are just a few of the commonly used passive auxiliaries that recent texts take little account of. Further, these books treat only the passive constructions listed in Svartvik's class A (clauses with animate agents) and class B (clauses with inanimate agents). Actually, 80% of the passive constructions normally used fall into Svartvik's class y (clauses without agents) and are virtually intransitive and equative in character.[42] In other words, the texts ignore all but the first one or two types in Svartvik's "passive scale," arranged below from agentful transitive to non-agentful intransitive types:

The house was built by experts.
The house was built of wood.
His bills are paid.
His bills are paid regularly every month.
His bills are paid, so he owes nothing now.
The snow was piled high by the wind.
The snow was piled high by the door.
The village was (appeared, lay, looked, seemed) quite deserted.
He felt thoroughly disappointed.[43]
The door remained locked.

Second, the anti-passivists fail to identify the special advantages the passive voice offers a writer, particularly a technical writer. For example, the passive is uniquely suitable to and frequently used with long nominal groupings at the end of a sentence. Where an actor or agent is, therefore, part of a bulky nominal grouping (as is often the case in technical writing), it is better placed at the end of the sentence than in the subject position.[45] That is why the passive version of the following idea sounds more efficient than the active:

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The fabric was bleached with a pink, filmy liquid which the acid solution had produced.

The pink, filmy liquid which the acid solution had produced bleached the fabric.

Also, the passive can help the technical writer maintain proper FSP (functional sentence perspective) flow--that is, the logical progression from known to unknown.[46] The principle of FSP may even make the passive "obligatory" in a definition like this one:

Sediment will be defined in this study as residue of dirt or decayed organic matter resting on the ocean floor within 20 feet of the Nassau shore.

It goes almost without saying that the passive is obligatory where the agent is unknown or irrelevant, a circumstance quite common in scientific writing. In this sentence

Eight minutes later, the patient was exhausted.

the patient was undoubtedly exhausted by something, but the cause of exhaustion (if extraneous to the report or unknown) need not be considered if the passive is used.

This discussion would not be complete without reference to the usefulness of the participial and infinitive passives, both of which are liberally (and, I am sure, unwittingly) incorporated into current technical writing text models. In the following sentence from Houp and Pearsall's text, "needed" is a participial passive and "to be taken" and infinitive passive. Of course, the main verb ("must be considered") is also passive:

In establishing a method to remove the lake deposits, three factors must be considered: needed equipment, legal steps to be taken, and the disposition of the deposits.[47]

The phrase "needed equipment" is clearly some sort of elliptical construction signifying "The equipment is needed." Similarly, "legal steps to be taken" is a shorthand construction signifying "Some unidentified object should take legal steps." These infinitive and participial genres of the passive, which have not been included in the verb counts used in this article, warrant further study. Even in nontechnical writing, these forms are important shorthand by-products of the passive transformation.

The passive voice is not an anachronism. It is an essential and acceptable function of English syntax because it facilitates certain identifiable arrangements of information and coordinates well with a variety of tones and points of view. Under certain circumstances which arise frequently in technical writing, passive is actually preferable to active. When used properly and intelligently, it is a clear and economical form of expression fully appropriate in the technical context. The 1980's should signal a shift in the scholarly winds--and a full vindication of the passive in technical writing.

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Panel B-20

Writing Programs: Connections Between

the Collegiate and Business Worlds

TECHNICAL WRITING AND THE MARKETPLACE

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INTRODUCTION

There are many different kinds of job situations which students of technical writing may confront, but most of them fall into two major types which correspond to two major types of students who take technical writing courses. On the one hand is the specialist, the trained scientist, engineer, or technologist who will have learned to write unusually good correspondence, proposals, and reports on the job. On the other hand is the professional communicator, who may have only a general understanding of the sciences, but who can translate what he learns on the job into language and graphic forms that communicate effectively with anyone from production line workers through engineers to management.

As for the first type, the specialist, job opportunities will be determined primarily by the specialization, the current supply of and demand for geologists, electrical engineers, computer scientists, or whatever. Technical writing will give such graduates a decided edge in the market, and their communication skills will undoubtedly accelerate their advancement into managerial positions. But of greater interest to us here today are the opportunities for the second type, the professional communicator.

THE GROWING MARKET

Technical communications—as a profession rather than as an extra skill possessed by a professional at something else—is a rapidly expanding job area, the potential for which has only begun to be recognized. In some companies the profession is well established. Western Electric, for instance, employs over 1000 technical communicators in its publications center in Salem, North Carolina. Sundstrand, for another example, keeps a technical communications staff of over 150 at its home plant in Rockford, Illinois. Many other companies keep staffs of anywhere from one or two persons to several dozen. The greatest potential, however, lies in the uncounted number of companies that do not seem to fully understand what a technical communicator is. I shall speak more of it shortly, but this lack of understanding together with the lack of much in the way of market studies makes it difficult to assess how big the market really is. What does exist, however, shows great promise.

A few years ago Sundstrand sponsored a survey which found that from 1976 through 1981 just the industries in Rockford, Illinois would require

141 new technical communicators. In a more recent survey done closer to Bowling Green the results are even more encouraging. Thomas Buehrer, a master's student in our technical writing program, is currently completing a study of the job market for technical writers in Ohio and Southeastern Michigan. Over an eight-week period in 1980 (19 October-7 December) he checked the Sunday classified sections of eight major area newspapers, The Akron Beacon Journal, The Toledo Blade, The Cincinnati Enquirer, The Cleveland Plain Dealer, The Columbus Dispatch, The Dayton Daily News, The Detroit Free Press, and The Detroit News. After eliminating any repeated advertisements, he found 121 different employment opportunities for technical writers listed during that period. A more thorough analysis of the data is still in progress, including listings of companies, their locations, salary ranges, and the experience and education required, but if we may extrapolate, we can expect to find nearly 800 technical writing jobs listed in these eight newspapers over a year's time.

As encouraging as these preliminary results may sound, the true market picture for the technical communicator is probably more complex. Mr. Buehrer's completed study, I believe, will show that a great many of these jobs, probably many more than are necessary, specify highly specialized technical education and training. The reason for this is the lack of understanding in business and industry of what technical writers can do.

One indication of the continuing lack of awareness of the profession is the fact that the College Placement Annuals for both 1980 and 1981 list only 47 companies interested in "Writing and Editing--Technical"-- they list even fewer, 12, under "Writing and Editing--General." Obviously such a list barely scratches the surface of the potential market. Why so few companies seem aware of the profession is indicated by a more concrete example.

A year ago last Spring an electrical parts manufacturer in Columbus advertised not for a technical writer, but for an engineer with five years of publications experience. One of our technical writing students--with a Bachelor of Liberal Studies degree and no science background beyond the basic science and mathematics group requirements for an Arts and Sciences degree--answered the ad. What the company needed, he found, was someone to write safety and operational manuals for their plant. He convinced them that they probably could not find the person their ad described, nor could they find an engineer willing to write such manuals. What they really needed was a technical writer. He got the job.

Aside from reinforcing the fact that there are more jobs out there than one would suppose, there are two important conclusions suggested by this incident:

● Many technical writing jobs require much less technical training than is usually supposed.

● Business and industry need to be educated to the way technical
  writers can serve them.

TECHNICAL WRITING AND TECHNICAL TRAINING

How much technical training a technical writer needs is a highly
debatable issue. Certainly the more technical training he has the more
marketable he is. But here are some more indications of how a well
trained communicator can do the job with less technical training:

● A major Ford Motor Company executive tells us that Ford is
  beating the engineering shortage and saving money by hiring tech-
  nical writers for many jobs they used to hire engineers for.
● NCR has hired some of our technical writing graduates with
  only two computer science courses for jobs they used to think they
  needed computer specialists for.
● Sundstrand is willing to hire our technical writers if they
  have just a couple of electronics courses.
● We have placed graduates with similarly minimal technological
  training with such companies as Bell Laboratories, Hewlitt Packard,
  and Norden Instruments, as well as with NCR.

These examples indicate that very often little beyond basic introductory
knowledge of the technical field is required for a technical writer. If
the writer needs more information, most major companies have excellent
training programs that can efficiently provide what is needed, and if a
real technical expert is needed, the knowledgeable writer can usually
consult one. Moreover, as he works the writer becomes more expert, while
the company is able to use the real expert's time more profitably. In
short, well trained communicators who are familiar with the basic vocabu-
lary of the technological area can do the job.

CONVINCING THE MARKET

As we have said, however, much of business and industry still needs
to be convinced. Some of the ways this may be done are listed below,
arranged roughly in the order in which they might be done, although the
sequence is not of crucial importance.

Start by consulting with business and industry in your area. Ask
them what kinds of writing skills are most needed in the jobs they do and
most lacking in the people they hire. You will find many who feel
strongly committed to writing. Invite them to speak to your writing
classes.

Formalize this process of consulting by establishing, as Bowling
Green has, something like our Alumni Advisory Council to the Technical
Writing Program. This is made up of graduates with special interests in
communications and with executive positions in such firms as Owens-Corning-
Fiberglas, Batelle Memorial Institute, and Ford Motor Company. More re-

cently we have added an alumnae from our technical writing program now
with the Kettering Research Institute at the University of Dayton, and
we have expanded membership to include people who are not alumni. Among
those is Ted Brusaw of NCR, the coauthor of The Technical Writing Handbook,
one of the best textbooks in the field.

Join and participate in your local chapter of the Society for Techni-
cal Communication. STC is an excellent professional organization made up
of people who like their work and love to talk about it. Speak to members
about their needs and your program.. Bring your best students along to
chapter meetings and introduce them around. We have placed several stu-
dents in internships and jobs by way of STC meetings. We are also in pro-
cess of establishing a student chapter of STC at Bowling Green.

Establish an internship program. The practical experience of a quar-
ter or semester of full-time work as a technical writer is an essential
part of a student's program, but internships are also an important way to
sell the program. Many companies reluctant·to hire a technical writer
will take a chance on the short-term commitment of an internship, and if
one student does the job for them, they will come looking for more.
Moreover, internships offer the company an effective means of recruiting
and learning far more about a job candidate than any number of interviews
would do. Diebolt Corporation of Canton, Ohio interned three of our
students so far this school year and subsequently offered jobs to all three.
They are interning two more this Spring and are hungry for more.

Make use of your university placement office to meet company recruiters.
William Coggin, the director of Bowling Green's technical writing program,
has a standing invitation to lunch with any technical writing recruiters.
More than that, he watches the placement interview lists for other likely
prospects. Often companies asking for marketing or journalism majors
really need technical writers and don't know it. Over lunch is an excel-
lent context in which to sell the program, and Professor Coggin has used
this means to set up internships and job interviews and most recently to
recruit a new member of our advisory council, the senior software editor
for Digital Equipment Corporation in Nashua, New Hampshire.

There are no doubt other ways to cultivate the market, and of course
the ultimate success of any technical writing program is based on the qual-
ity of its product, the intelligent, capable, and well trained communica-
tors turned out by the program. But the market is unquestionably there,
large, growing, and able to take as many good people as we can turn out
for some years to come.