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ABSTRACT

A training program for technical writers, in which a specialized information focus is used to ask questions about a text in the process of writing and revising, is the subject of this paper. The unique aspects of technical writing are defined according to the process whereby readers extract information from text. Reader expectations are classified by levels of generality (real world knowledge, grammar, vocabulary, and immediate context) and by the type of intended audience. Actual samples of technical writing are analyzed to show how language options can be skillfully selected for the effective presentation of new, unpredictable information. (Author/JF)

AUDIENCE AND FOCUS IN TECHNICAL WRITING

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Related publications by the same author

1. Generative Stylistics: Between Grammar and Rhetoric, College Composition and Communication, 28, October 1977.

2. Information and Grammar in Technical Writing, College Composition and Communication, 29, December 1977.

3. Writing as a Decision Process, Language Today, Spring 1978.

4. Linguistic Theory and Composition, College Composition and Communication, 31, May 1978.

5. Information, Expectations, and Comprehension, Poetics, 7:2, Summer 1978.

6. Book review of Robert P. Stockwell, Foundations of Syntactic Theory, College Composition and Communication, 30, February 1978.

1. Technical Writing as a Special Text Type

1.1. It is essential to base training programs in technical writing upon a clear awareness of the distinctive features of that mode of language use. This paper will argue that teachers of technical writing should present and apply criteria for selecting the options of the language in accordance with their function in transmitting information.

1.2. Today's students draw on experience with everyday spoken discourse, often with substantial features of dialect. Such experience may be more of an interference than a support for technical writing. In the first place, speech that is simply written down is uncommunicative, deprived of such things as as stress, intonation, facial expression and immediate situation, all of which alert the audience about what information is important in the message. In the second place, the entire organization of speech depends on a distinct use of language options not typical of writing. Lacking the factors just cited as well as the opportunity for immediate feedback, the written text must be so efficiently planned that informational priorities would be clear to any reader in the intended audience. For instance, greater constraints on topic shift must be observec [1]. Syntactic placement must be used to compensate for the absence of modulations possible in the spoken voice only [2]. The text must be designed on the basis of astute predictions about an anticipated reader group, rather than upon direct experience provided by contact with hearers.

1.3. What are the features of technical writing as opposed to writing in general? Most people would mention at once a special vocabulary based upon Latin and Greek [3]. However, technical terms are quite often neither Latinate nor lengthy [4]. Whatever special terms are involved, they are readily acquired and in fact simple to use, since their meaning and hence their information content is clearly established for all readers in the field. Our students can consult the published manuals for special areas such as chemistry, physics, etc. Much greater care is needed with terms that have not only specialized meanings but ordinary meanings: a writer can easily confuse the reader by carelessly using the latter in the wrong context. For instance, an article on electromagnetism, optics, or binary mathematics should be careful about using "field" in some commonplace meaning like "profession" or "area of research." Hence, all non-distinctive, informationally important terms must be place in clearly determinate contexts.

1.4. Some linguists [5,6] have tried to define technical texts by internal grammatical features. However, as I have shown in detail elsewhere [7], the features of technical writing may in fact be quite similar to those of other text types, even poetry. What is different is something I shall call informational focus, a reading process specifically designed for each individual text type. The focus for poetry registers other features than that for technical writing, in accordance with distinct cognitive priorities.

2. The Informational Focus and Technical Writing

2.1. It would be useful to agree upon a definition of information. In information science, the informational value of any element is computed according to the probability of that element's occurring where it does [8]. If one has a language with an exactly defined number of choices at any point — for instance, a synthetic formal language — one can rely on precise statistics. But a language such as standard written English has no such exact limitations upon entropy, i.e. the number of alternative messages. Hence, we must replace statistics with our shared frameworks of expectations about what is normal in various contexts. We shall then view the reader not as an abstract machine processing input, but as a member of our society who shares our experience and uses the latter to predict what texts are talking about. Experiments in reading [9, p.59] show conclusively that "readers' language competence enables them to create a grammatical and semantic prediction in which they need only a sample from print to reach meaning." In artificial intelligence models [such as 10], the material used by readers in comprehending texts by prediction is seen as "default assignments" grouped in a "frame." When the readers perceive some material that matches a given frame, they are quite likely to make large-scale predictions unless clearly alerted by further material that fails to match. It is precisely for this reason that contexts determine so strongly how a term will be understood (see above). Writers, on the other hand, know what they mean in advance and tend to overlook potentially misleading combinations: their "frames" are selected in advance, while the readers must make a selection only after searching the text itself. Obviously, what writers mean to say is of no importance when the material on paper allows alternate, unintended but nonetheless plausible, interpretations. Yet our students have been conditioned by face-to-face speech, where one has many chances to restate things again and again; in fact, it is considered bad manners to ask for explanation as long as the meaning "somehow gets across." And of course, knowing one's hearers and speakers allows one to make good predictions, no matter what they are talking about.

2.2. It follows from the foregoing considerations that students must be trained to evaluate what they write on the basis of how well the readers will be guided correctly and efficiently in getting the important information from the text. The problem is that the writers fall victim to their own set of frames when they turn readers: their first-hand knowledge of what the information is supposed to be makes them blind for the difficulties that those without such knowledge may encounter. To overcome this effect, the teaching of technical writing should provide training in the use of not the conventional information focus, but a specially conditioned focus that detects and solves problems. The basic technique to be considered here is used both in artificial intelligence models [11] and psychological information tests [reported in 12] and consists of inserting questions into the text.

3. A Specialized Focus for Technical Writers

3.1. The first thing a writer must ask is: what is being presupposed and expected of anyone who wants to read the text? It is useful to subdivide this question into various levels of expectations that can be "addressed" in a text. In any society, readers agree about what is normal in the "real world," that is, in the accepted model of the human environment. Obviously, not all input from the environment is considered information worth attending [13. p. 202ff.]. By deciding to attend to only certain information, people make it very easy to react in "normal" situations and to understand "normal" language samples. In addition, speakers of English will largely agree about what kinds of grammar and what vocabulary items are 1) normal in English, and 2) acceptable in familiar text types. For example, some technical writers have recourse to long, unfamiliar words which aren't at all necessary, simply because they assume such words to be expected in technical writing. Finally, there are expectations created within the text itself, which are often matched to the two levels just mentioned, but which can be very powerful on their own and override the others. Thus writers must ask themselves the question about expectations on at least three levels: 1) "real world knowledge" (sometimes called also "common sense knowledge", 2) grammar and vocabulary, and 3) what fits in the framework of the text at hand.

3.2. In the case of technical material, the first level is directly decided by the basic knowledge in that area of study. However, an important distinction must be made right away: are the readers familiar with the area, or is the writer going to introduce them to it? Only in the former case can writers presuppose any specialized knowledge. In the latter case, writers must foresee problems and misunderstandings which they themselves could never encounter. And what of the scientists who are trying to gain some knowledge in a neighboring area outside their specialization? Can a writer afford to exclude them by insisting upon insider's jargon and very detailed presuppositions? Not many of our students are likely to be able to afford this in their later careers — quite aside from the basic issue of courtesy being violated. Writers who consistently ask themselves what information is needed to understand a given passage could always make the specialized knowledge accessible, at least by clear references to relevant sources. In this way, the differences in previous reader training are less crucial, and the writers reach a larger audience.

3.3. A similar attitude should be maintained at the level of selecting vocabulary. Purely decorative terms must be rejected in favor of terms whose informational content is quickly and unambiguously discoverable. For instance, referring to a technical device or principle simply by the name of the original inventor is wholly uninformative for many possible readers and should be accompanied either by references or better still, by a brief explanation. It is discourteous to make readers run to the dictionary or to the library when the difficulty of the topic doesn't really require it. As a professional linguist doing research in psychology, I am inconvenienced when a very worthwhile book such as [14] introduces without the slightest explanation such things as "a Poisson variable" [p. 131], a "Newman-Keuls procedure" [p. 160] or a "Euler constant" [p. 191]. Surely statisticians are not so utterly desperate for terms that people's names must be used instead of self-explanatory words!

3.4. Vocabulary selection is also important because it creates contexts. Readers expect to find terms selected from a coherent area of discourse, not a jumble of terms from chemistry, anatomy, newspapers, and poems. Yet all too often one finds jumbles of just this kind, because writers are not asking themselves the question: what area is this term from, and does it fit the others I'm using? Only writers who do this will see how much confusion can arise from using the same word in a technical sense and then in an everyday sense, as already mentioned.

3.5. The options of grammar, as I suggested before, are even more vital considerations in writing than in speech. In writing, the information which vocabulary items can contain must after all be organized according to the priorities of that particular topic and of the point to be made. For example, consider these two sentences appearing in a text:

(1) Einstein solved this important problem also.

(2) This important problem was also solved by Einstein.

Only one word has been added to (2), and the active replaced by the passive. Yet the first sentence would only be effective in a passage talking mostly about Einstein, and the second only in one talking about the problem. The questions which the students could be directed to ask for the samples must be:

(3) What else did Einstein solve? (for number 1)

(4) Who else solved the problem? (for number 2)

There are of course more options for still greater emphasis. Suppose that it were not expected to have Einstein mentioned here at all. Then one could use the so-called "cleft" sentence beginning with "it" plus a form of "be":

(5) It was Einstein (himself) who solved this problem.

(6) It was none other than Einstein who solved this problem.

The additional elements further address presupposed information. If we write "himself", we presuppose the "real world knowledge" than Einstein was a very important person. If we write "none other than" we presuppose this same thing and also that the readers wouldn't expect Einstein to have achieved the task mentioned. If readers may know that someone solved the problem, but be in doubt about the person's identity, a different type of "cleft" sentence will serve:

(7) Einstein was the one who solved the problem.

These special placements are surveyed in [15, pp. 169-85]. They cause a shift of focus for readers in which attention is redistributed toward the items which the writer considers important. If such placements are overused, they soon lose their effect, becoming themselves the normal state of things.

4. Applications of the Method

4.1. I have not yet assembled all of the criteria for efficiently evaluating the various kinds of information employed in processing texts (to be later set forth in [16]). However, it does seem clear what the main types of questions are that readers should ask themselves concerning what is expected of a reader audience. I would like to apply the method I have outlined to some actual samples of technical writing, hoping that illustrations may serve to justify the theory advanced this far.

4.2. First, let us consider the issue of the relationship of sentence order and grammar to information in this text [5, p. 121]:

(8) Diethyl ether has been reported to stimulate respiration [...] Diethyl ether in constant concentration was administered through a non-return system. Expiratory volume was measured with a Wedge chronometer.

Aside from possibly unfamiliar terms, this text is clear and easy to read. Why? The information content is arranged in such a way that the normal positions for new information (the later part of the sentence) and for stated or implied information (the early part of the sentence) have been closely observed. Since the first sentence mentions diethyl ether and what it has been "reported" to do (I omitted the references here), the readers assume that some comparable experiment will be described. The second sentence neatly confirms that expectation by taking the same item, "diethyl ether," as its starting point. The third sentence begins with "expiratory volume," which is implied information, being a logical component of the more general "respiration" in the first sentence. We notice that the passive has been selected as the grammar option most suited to an effective distribution of information. It would be less normal for the second sentence to uso an active construction naming the (here not relevant) agent:

(9) I administered diethyl ether in constant concentration. . .

This sentence fits the question "what did I administer?", which need hardly be asked at all after the first sentence created strong expectations. But if a non-expected substance had been used, the writer could well say:

(10) Instead, we administered ethyl alcohol in constant concentration. . .

This sentence has focus on the substance plus the signal "instead" which tells readers to revise their expectations. Now, our sample is interested in getting two things across: the conditions under which the (expected) substance was administered (sentence 2) and what measurements were taken (sentence three). Notice that the latter positions of the sentences are used here. If students read them aloud, everyone will hear that the highest stress point falls on this very information [cf. 17]. Therefore, the passive is often <u>motivated</u> in technical writing by the desire to focus on procedures and data (rather than upon the researchers as agents) and to add to the known information step by step. No gaps are left in this text other than the very logical transition from whole to part ("respiration. . .expiratory volume"). If the chronometer must be a special type, it would be better to cite the essential characteristics rather than a person's name ("Wedge").

4.3. I mentioned already the vital distinctions between non-specialist and specialist reader audiences. This sample of technical writing for non-specialists is very instructive:

(11) Waveguide systems are often loosely called "plumbing." The name implies a network of empty pipes where electrical energy flows unimpeded. Actually, a waveguide is a precisely-designed, electrically-tuned structure for propagating electromagnetic waves. It transmits certain determinable frequencies well, does not transmit some frequencies at all, and transmits others only with large losses [18, p. 48]

This text also begins with the main topic right away: "waveguide systems." The subjects of all the following sentences return to this information: "the name," "a waveguide," and "it." The passive figures only in the first sentence, since the topic "waveguide" can and does figure as agent later on. The new information falls uniformly in the predicate. To account for the readers' non-specialized background, the unfamiliar object "waveguide" is right away set in metaphoric relationship to the familiar "plumbing." The metaphor is a device depending upon the shared properties of things [19]. The writer thus goes on to state what properties are shared by the unfamiliar and the familiar items in this case: "network. . .pipes. . .flows." However, the writer warns the readers that the two items are <u>not identical</u> by signals of reservation: "loosely. . .implies. . .actually." In this way, known information of readers is addressed, but the readers are impelled to modify the frames which have just been called upon. The modifications allow the integration of the ways in which "waveguides" are not like "plumbing": "precisely-designed, electrically-tuned," intended for a special purpose ("propagating electromagnetic waves") with special limitations upon what they can transmit (last sentence). In other words, the new item is first given some general formal resemblance to a known item and then differentiated from the latter by a definition of its operation. No specialized terms are used at all, expect the main item "waveguide." Even this is self-explanatory: it guides waves. The operation is made especially clear by repetition and grammatical parallelism: the subject "it" is retained in three clauses, the verb "transmit" repeated three times, and the direct object is in each case some members of the same large class of "frequencies." The differences in frequencies are not yet vital. The fact that these differences exist is, however, and the general similarities within the last sentences allow the differences to emerge with special force, like raised objects against a flat background. This information is added in small steps, and neither special knowledge nor extensive inferences are required.

4.4. In contrast, here is a text for specialists:

> (12) The glycolytic system of Ehrlich ascites cells, with all enzymes of the pathway present in proper amounts and with appropriate reverse reactions, was simulated by a computer model, derived from previous work [...] by adjustment of numerical values and inclusion of missing reactions. Numerical constants are determined from the experimentally observed "inhibited" steady state (with excess glucose) and then adjusted so that the model will also hold the observed endogenous steady state and follow the observed transient kinetics [...] when glucose is added to resting cells. [5, p. 119]

Obviously, the text could not be read by people unacquainted with microbiology. But several professors of microbiology, including some experts in virology,[1] found the text hard to read, even though they understood it. What questions does the text answer and what others are left unclear? Firstly, special terms must be recognized. A "glycolytic system" describes how cells use glucose either by synthesizing it or forming other products from it: hence "reverse reactions" are, in theory at least, always possible. The

[1] I am indebted to Prof. David A. Wolff of the Ohio State University for his interest and help.

reactions in either direction must follow "pathways" of steps that one could well simulate on a computer. Anyone at all interested in this report would have to ask: how does one set up the model, and how is the model like or not like the real thing? As we shall see, the text leaves the answers to this questions unclear.

4.5. The key term "Ehrlich ascites cells" is known to most microbiologists, but my survey showed that it would indeed be both considerate and useful if this writer had reminded readers about what is involved: tumerous cells floating in ascitic fluid that accumulates in the abdominal region of animals. The use of the person's name who first studied the cells is rather unenlightening.[2] Now, this text deals with simulated models, not with real cell reactions. We are simply told that the data from a cited source (the first omission in my sample) was "adjusted" and that reactions which must have been "missing" in reality but were needed for unspecified reasons, were "included." One must not only run to look up the "previous work" not even summarized here: one still wouldn't know how things looked after the "adjustments." There are two "steady states" mentioned in the second sentence, one of them normal to the system ("endogenous") and one somehow different because of being "inhibited." One notes the unexplained use of quotation marks, suggesting some possible metaphor: what is the difference between being inhibited and being "inhibited"? And was the state prevented from occurring or from changing? My respondants all agreed that the questions raised above are not solved by the text, nor are the answers readily obvious, even to specialists.

2 Terminology in microbiology and virology is chaotic. Types of cells or viruses are named after researchers who isolate them or after the towns or even the individual people in which samples were first found. No one could tell me for sure which is true here. Perhaps the name comes from the eminent bacteriologist Paul Ehrlich (1854-1915). But aside from a possible date implied in his discovery, we still wouldn't learn anything from that.

4.6. By the standards I suggested before, sample (12) is not well planned. Readily predictable reader questions are not dealt with effectively. The sentences are long and clumsy, and terminology either vague or needlessly complex. Let us compare a revision of the same text with the original:

(13) The glycolytic reaction systems of tumerous cells in abdominal ascites fluid was simulated by a computer model. The model. which included proper amounts of enzymes in the pathway and allowed for reverse reactions, was obtained by modifying the data in [...] as follows: [...]. Using observations of real experiments, we derived numerical constants for: 1) the endogenous steady state, 2) a steady state artificially induced with excess glucose, and 3) the rates at which resting cells react to added glucose.

This version begins with a clear statement of the topic, suitable for a wider reader audience than was the case in the original. New information is added step by step with known information followed by new. Sentences are short in order to keep these steps distinct. When the agent "we" is crucial in showing who created the "constants" in question, it is used instead of the passive of the original. Specialized terminology has been replaced with terms accessible to any biologist. In short, this version is easy to read because possible reader problems are anticipated and non-ambiguous answers are provided. Notice that clarity and courtesy do not lead to sacrificing that brevity which editors of technical journals admire so much: the original has 84 words and my version 75. The writer might use the saved space to clear up just what those "adjustments" and "inclusions" would mean for the applicability of the model to the real thing.

1. T.A. van Dijk, Text and Context, Longman, London, 1977.

2. R.A. de Beaugrande, Information and Grammar in Technical Writing, College Composition and Communication, 29, December, 1977, 325-32.

3. L. Hogben, The Vocabulary of Science, Stein and Day, New York, 1970.

4. A. Rapoport, The Language of Science: Its Simplicity, Beauty, and Humor, H. Blickle and M. Passe (eds.), Readings for Technical Writers, Ronald Press, New York, pp. 20-32, 1963.

5. M. Gopnik. Linguistic Structures in Scientific Texts, Mouton, The Hague, 1972. The later citations of this book are texts originally coming from Proceedings of the Federation of American Societies for Experimental Biology.

6. R. Huddleston, The Sentence in Written English: A Syntactic Study Based on an Analysis of Scientific Texts, Cambridge University Press, London, 1971.

7. R.A. de Beaugrande, Information, Expectations, and Comprehension: On the Classification of Poetic Texts, Poetics, 7:2, 3-44.

8. C. Shannon and W. Weaver, The Mathematical Theory of Communication, University of Illinois Press, Urbana, 1949.

9. P.D. Allen and D.J. Watson (eds.), Findings of Research in Miscue Analysis, National Council of Teachers of English, Urbana, 1976.

10. M. Minsky, A Framework for Representing Knowledge, P.H. Winston (ed.), The Psychology of Computer Vision, McGraw-Hill, New York, 1975, pp. 211-80.

11. E. Charniak, Toward a Model of Children's Story Comprehension, PhD Thesis, Massachusettes Institute of Technology, Cambridge, 1972.

12. S.W. Keele, Attention and Human Performance, Goodyear, Pacific Palisades, 1973.

13. E. Goffmann, Frame Analysis, Harper and Row, New York, 1974.

14. W. Kintsch. The Representation of Meaning in Memory, Lawrence Erlbaum, Hillsdale, New Jersey, 1974.

15. G. Leech and J. Svartvik, A Communicative Grammar of English, Longman, London, 1975.

16. R.A. de Beaugrande, The Stylistics of Communication, under negotation with Oxford Press, New York, ca. 1979.

17. W. Chafe, New and Old Information, Meaning and the Structure of Language, University of Chicago Press, Chicago, 1970.

18. K. Houp and T. Pearsall, Reporting Technical Information, Glencoe, Beverly Hills, 1973.

19. J. Pelc, Semantic Functions as Applied to the Analysis of the Concept of Metaphor, D. Davie (ed.), Poetica, Poetyka, Pánstwowe Wydawnictwo Naukow, Warsaw, Poland, pp. 305-40, 1961.