THE COMPOSING PROCESS IN TECHNICAL COMMUNICATION

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

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

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

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

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

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A THEORETICAL VIEW OF THE COMPOSING PROCESS IN TECHNICAL COMMUNICATION

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Introduction

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

Rhetorical Features of Technical Communication

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

Given that we accept technical and scientific communication as rhetorical, such a perspective emphasizes the relationship between author, reader, and text: 1) rhetorical and

technical communication both begin with a proposition; 2) both rely on form as an important part of subject matter; and 3) both tailor text to suit audience.

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

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

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

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

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

Technical communication shares classical rhetoric's concern for analyzing one's audience and for tailoring the text to suit its needs. Textbooks by Houp and Pearsall, Pearsall and Cunningham, and Mathes and Stevenson, for example, emphasize the importance of communicators' knowing and writing to audience needs. Presenting the precise information that a reader needs with precisely the order and clarity that a reader's cognitive

structure expects are some of the reasons which justify this concern. As mentioned earlier, Halloran and others have described the technical communicators' concern with having their discourse appeal to and be accepted by the technical and scientific community. If the engineers and scientists fail to assess their audiences properly and fail to write with an accurate understanding of audience needs in mind, their communications will be much less likely to succeed.

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

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

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

Theoretical Background for Process-Based View of Technical Communication

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

TASK ENVIRONMENT

WRITING ASSIGNMENT

Topic

Audience

Motivating Cues

TEXT

PRODUCED

SO FAR

WRITING PROCESS

THE WRITER'S LONG-TERM

MEMORY

Knowledge of Topic

Knowledge of Audience

Stored Writing Plans

GENERATING

PLANNING

ORGANIZING

GOAL
SETTING

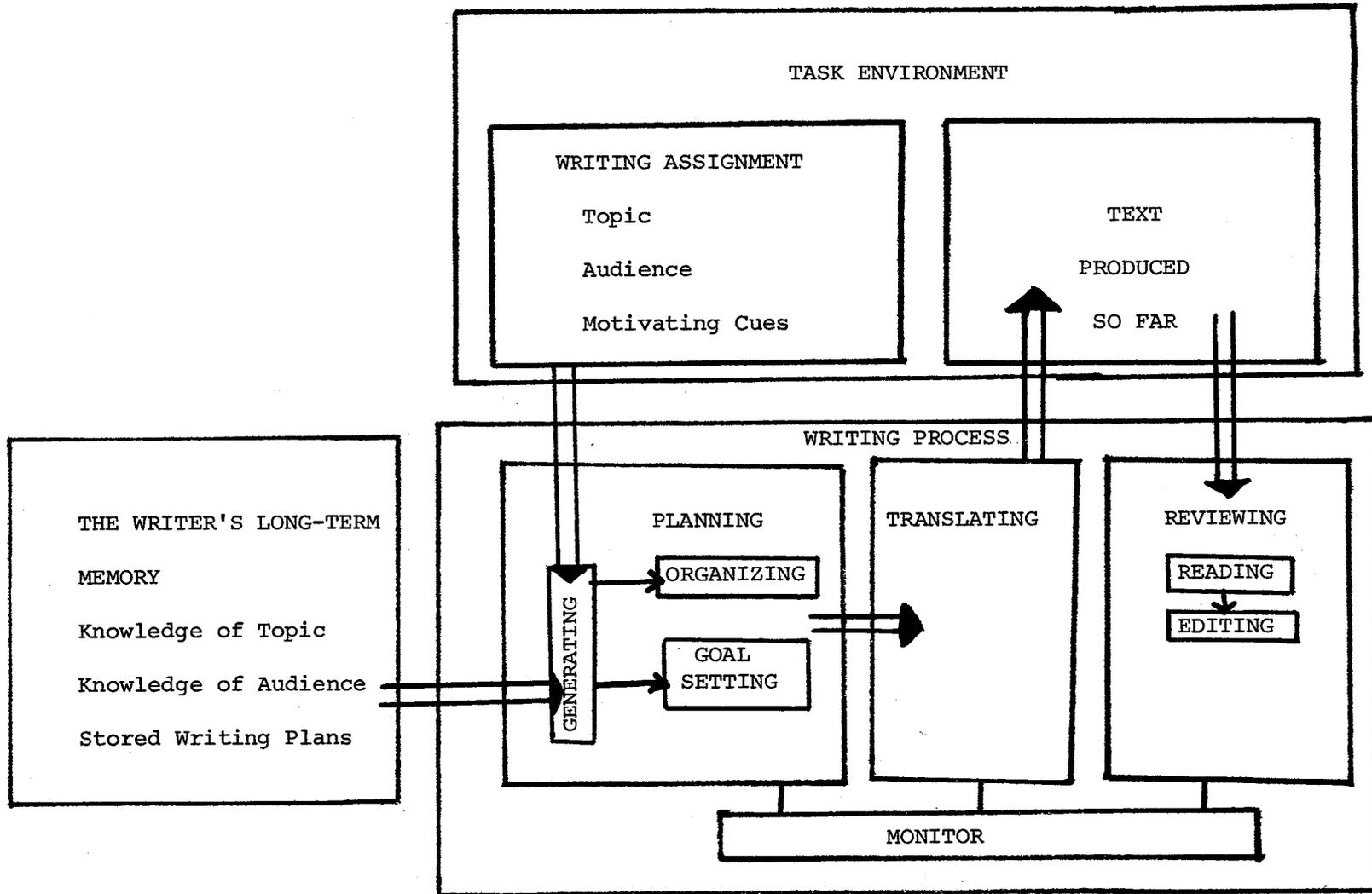TRANSLATING

REVIEWING

READING

EDITING

MONITOR

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

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

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

A Process-Based View of Technical Communication

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

But discovery for technical communicators does not
necessarily end when they attain the results of their research.
The thinking and planning processes of writers continue as they
transform what Vygotsky called "a saturated sense" of what the
writer intends into syntactically articulated speech
representative of meaning and intelligible to others.
Specifically, the thinking processes of technical communicators
continue as they discover, through writing, how they intend for
their results to be acted upon and also as they write a

communication designed to achieve these intentions. The
problem-solving nature of this discovery process is implied in
Designing Technical Reports, by J. C. Mathes and Dwight
Stevenson : "When you (as an engineer) write reports, . . .you
must think in terms of the concrete needs of specific persons in
the organization and of the various effects the report will have
in the organization. You must design your report to affect the
organizational system in ways that you intend."[5] This kind of
analysis goes beyond designating audience and purpose at the
outset of writing and merely presenting the results of one's
research; it requires continuous goal-directed thinking about
the context for these results.

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

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

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

The dimension that a process view of composing adds is
that the relevancy of facts is not determined by the facts
themselves, but by the goals established by authors as they
write. Choosing facts becomes a sub-process of goal-setting and

organizing because a high level goal for writing enables a writer to search for and choose subordinate information which will reinforce the goal. This means that as a writer's goals evolve and change, the facts selected and their order of presentation may also change.

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

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

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

to match that goal. Revising and editing in technical communication, so often thought of as fixing up, should preferably be thought of as a necessary process of refocusing and reformulation to define and satisfy the optimum rhetorical problem in light of a re-perception of the text, the problem, and its effect on a reader.

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

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

1. S. Michael Halloran, "Technical Writing and the Rhetoric of Science," Journal of Technical Writing and Communication, 8 (Spring 1978), 80.

2. Halloran, p.82.

3. John R. Hayes and Linda Flower, "Uncovering Cognitive Processes in Writing." To appear in Research in Writing: Principles and Methods, eds. P. Mosenthal, L. Tamor, and S. Walmsley, (New York: Longman, in preparation).

4. L. S. Vygotsky, Thought and Language, (Cambridge, Mass.: MIT Press, 1962), p. 148.

5. J. C. Mathes and Dwight W. Stevenson, Designing Technical Reports : Writing for Audiences in Organizations, (Indianapolis: Bobbs-Merrill, Co., 1976), p.6.

6. Linda Flower and John R. Hayes, "A Cognitive Process Theory of Writing," Working Paper, NIE Grant, (1980), p.8.

7. David Hamilton, "Writing Science," College English, 40 (September 1978), 33.

8. Hamilton, p. 33.

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

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

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

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