ORGANIZATIONAL PROCESSES: A STUDY OF 14 TECHNICAL WRITING STUDENTS

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PREFACE

This thesis presents the results of a study of the organizational processes of fourteen technical writing students. The students were enrolled in two of my classes at Marshalltown Community College in Marshalltown, Iowa, in the spring semester of 1985. The students participated in experiments in which they reorganized scrambled writing while thinking aloud into a tape recorder. Using one class as an experimental group, the other a control group, I conducted minilectures on organization to the experimental group between pretest and posttest experiments. One of the results of my study was that the experimental group improved their performance in the posttest. Furthermore, by studying the transcripts of the students' tapes, I was able to piece together the strategies the students used in organizing. The transcripts gave me the opportunity to examine the process of organizing, rather than just the product.

I acknowledge the support and interest of the Deans of Marshalltown Community College, Drs. Paul L. Kegel and Donald A. Fleming, and their staff members who provided time and encouragement. I also express thanks to the fourteen students who participated in the study. They gladly gave their time to act as subjects for the

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Finally, I deeply appreciate the encouragement provided by my husband, Dr. Thomas B. Colbert, who has had the job of advisor and editor and the even more challenging job this year of father to our two-year-old son, Matthew Moffatt Colbert.

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CHAPTER I

INTRODUCTION

For the past two decades, researchers have been exploring cognitive processes involved in writing. They became interested in finding out what writers think when they write, in how they formulate their ideas and in how they present them. Janet Emig was the first to use thinking-aloud protocols in her research of the composing processes of twelfth graders, a study she published in 1971.[1] Her method involved having an observer sit with and make notes of a subject while the subject was composing, with a tape recorder monitoring the process. Since then, thinking-aloud protocols have been conducted using video tape machines to capture some of the nuances of the writing process that audio recordings alone could not. Both of these devices have advanced thinking-aloud protocol research phenomenally. In analyzing the protocols, researchers have sought to categorize information in hopes of understanding the thinking processes involved when people write. The possibilities for discovery are almost limitless.

My thesis used thinking-aloud protocols as a research device; however, my subjects did not perform a composing

task. Instead, they reorganized groups of randomly ordered sentences into what they considered the most logical arrangement. I was interested in discovering whatever I could about the specific area of organizing written information. My goal was to find out what kinds of strategies students typically rely on to organize. I furthermore sought to understand how different students organize and why they succeed or fail in the task. In conducting experiments on organizing in both a pretest and posttest, I wanted to find out if the specific attention I was devoting to the subject of organization in my experimental class helped them organize better.

In Chapter II, I present a review of the literature that is both general and specific. I cite studies on the process of composing and their general aims and findings. Then I discuss some of the particular methods that researchers studying composing have employed. Following that, I focus on the special method of thinking-aloud protocols and finally discuss some of the particular areas of interest of a number of researchers, such as writer's block and the revision process.

Chapter III details the methodology that I used in my research. I outline the steps in creating my experiments from the experimental design to choosing samples for the experiments to the actual layout of the test sheet and the features of the testing itself. I discuss in detail the strategies I used to devise a scoring system for the

protocols. Finally, I discuss the minilectures I gave to the experimental group on aspects of organization.

My fourth chapter presents the results of the study. I include the demographics of my 14 students, from grade points to ages to majors. I also give the statistics of their scores on the tests and the recording times. Most of the chapter is devoted the protocol analysis, where I discuss the characteristics of the taped transcripts and outline the implications they suggest.

In Chapter V, I synthesize all the disparate elements of the experiment, and I conclude with generalizations concerning organizing in general and teaching organization in particular.

ENDNOTE

[1]Janet Emig, The Composing Processes of Twelfth Graders, NCTE Research Report No. 13 (Urbana, Ill.: National Council of Teachers of English, 1971).

CHAPTER 2

LITERATURE REVIEW

In Teaching the Universe of Discourse, James Moffett proclaimed that "grammar tyrannizes over language teaching not because the sentence unit is a sensible learning unit but because we think we know more about the sentence than about whole pieces of discourse."[1] Moffett pinpointed one of the major problems of teaching writing--lack of knowledge about what writing involves. For the last two decades, researchers have been dealing with that problem and have been discovering trends and devising useful theories about composing. The traditional approach to teaching writing, with its emphasis on correct usage and eloquent style, has given way to a more functional approach of teaching the skill of composing. And the current research is absorbed with uncovering the processes involved when we compose.

Research on the Composing Process

James Moffett saw the need for reforming English curricula that was "turning out glib Advanced Placement students who know all the critical jargon and can talk about writing endlessly, but who do not write well" (p. 7).

Moffett's strategy for teaching English involves, first, viewing English as a symbol system (with mathematics and other languages) rather than as a content subject. Therefore, learning English involves becoming proficient at a skill, learning "how to" rather than learning "about." Secondly, the students must work with the language in a realistic way. They must use it rather than study it. He suggests that rather than reading pieces of writing, students should engage in activities that can realistically lead to writing. The method includes dramatic improvisation, discussion, play performing, writing scripts and dialogues, and reading in this "dramatic pedagogy." It is realistic because, as Moffett points out, "Ultimately a student, or adult for that matter, is more interested in his relation to other people than he is in a subject" (p. 119).

Central to mastering writing, according to Moffett, is intellectual growth through learning to abstract. He argues that intellectual growth can be measured by the increasing levels of abstraction that a person perceives. In teaching writing, Moffett has formulated types of narrative writing that move to higher levels of abstraction from interior monologue to anonymous narration. Each technique is "more comprehensive and abstract, takes in more territory than the ones before it" (p. 147). Understanding this spectrum and being exposed to new levels of abstracting are all a part of learning, of discovering

new points of view, or, as Moffett calls it, "decentering" (p. 148).

In a similar vein, Donald M. Murray in "Internal Revision: A Process of Discovery" presents the idea that many writers do not know what they think until they write.[2] And he furthermore concludes that academic writers, especially when revising, usually discover ideas but are afraid to admit that their original writing plan could be transformed. Murray thus stresses the need for more focus on revising in the classroom and in research to explore the idea of discovery, suggesting some interesting research questions about the attitude of revising, the habits of writers, the process of revising itself--all in an effort to understand the connection between composing and thinking.

The connection between writing and thinking has been explored in another way by Janet Emig. In "Writing as a Mode of Learning," she compares writing with the other language processes of listening, talking, and reading and specifically outlines the ways talking and writing differ: writing is learning behavior whereas talking is natural; talking depends on the environment whereas writing creates its own.[3] Her most cogent point about writing as a mode of learning is that the art of writing involves many processes at one time. Writing is "the symbolic transformation of experience through the specific symbol system of verbal language . . . shaped into an icon (the graphic product) by

the enactive hand" (p. 126). Emig follows this research direction in "Hand, Eye, Brain: Some `Basics´ in the Writing Process" by exploring the role of these organic components of the writing process.[4] The hand mobilizes the writing process, makes the writing personal, reinforces the work of the left hemisphere of the brain, and slows down the process of writing. The eye is important in each of the three stages of composing--prewriting, writing, and revising. Emig uses as an example the blind Jean-Paul Sartre, who stated that revision was impossible for him with a tape machine because of the difference between reading and listening. The brain´s involvement in the composing process is significant, and it has been studied with brain-damaged subjects, but questions remain about how the brain functions during writing.

Another component of the writing process that at least Sondra Perl has considered is the "felt sense."[5] In "Understanding Composing" she discusses the ways this merging of mind and body manifests itself in writing. The felt sense is what some writers have called inner voice or inspiration. Perl thinks that skilled writers have recognized the felt sense and have learned to use it in their writing. As Perl puts it, "If we are writing about something that truly interests us, the felt sense deepens. We know that we are writing out of a `centered´ place" (p. 367).

Lee Odell makes another appeal for teachers to

understand the complexity of writing tasks in "The Process of Writing and the Process of Learning."[6] He notes that in working with colleagues from departments other than English, the concern about poor student writing was widespread. These colleagues recognized that writing might help students better understand the content of their courses. The idea that writing helps to formulate ideas is nothing new. But Odell suggests that we underestimate the complexity of writing and can learn more about the process by examining students' writing in other disciplines. He uses the example of a history paper on Adolph Eichmann, citing passages from a Life article narrated by Eichmann. The formulation of an idea for the paper--how to assess Eichmann--is Odell's chief interest. Students, he says, "raise questions that are interesting but that presuppose the ability to engage in rather complex and in some ways diverse conceptual activities" (p. 48). If students are made to engage in these writing activities, teachers have the opportunity and obligation to learn more about how these tasks are accomplished, which should provide them with more insights into the composing process and the learning process.

Linda Flower and John R. Hayes also approach the subject of the complexity of writing in "A Cognitive Process Theory."[7] Their theory suggests that the act of composing consists of distinctive thinking processes that are hierarchical and highly embedded. During the act of

composing, a writer is guided by a growing network of goals that are developed by his sense of purpose and by what he has learned in the act of writing. Flower and Hayes note that these networks of goals have three important features: First, they are created as people write and throughout the process. Secondly, the thinking that produces these networks takes many forms; and the goals are not always "elaborate, logical, or conscious" (p. 379). Thirdly, in creating the goals, writers continually return to the higher-level goals. Flower and Hayes point out that poor writers seem to rely on the higher-level goals, which are typically abstract and undeveloped, rather than the middle-level goals that "lie between intention and prose" (p. 379) and that help good writers give breadth to their writing. Again, the idea that writing generates thinking is clear. Flower and Hayes state that "if one studies the process by which a writer uses a goal to generate ideas, then consolidates those ideas and uses them to revise or regenerate new, more complex goals, one can see this learning process in action" (p. 386).

In another article, "The Cognition of Discovery: Defining a Rhetorical Problem," Flower and Hayes take issue with the word <u>discovery</u> to describe the ideas that surface in the act of writing.[8] They would use the word <u>create</u> instead, for they see the writing process as "creating new concepts out of the raw material of experience" (p. 22). Writers have to create these concepts on the basis of

whatever kind of rhetorical task they have set for themselves. In other words, how are they viewing their purpose and audience and their role as writers? Flower and Hayes, with this notion that "writers themselves create the problem they solve" (p. 23), set out to discover if there are differences between how writers define their rhetorical problems. They wanted to know if good writers and poor writers use different approaches. Not surprisingly, they found that good writers are concerned with all aspects of the rhetorical problem while poor writers are primarily concerned with the text. For example, good writers consider audience at the beginning and continue to consider the audience while writing. In short, good writers prove how complex writing is by considering the entire the rhetorical situation, including audience, purpose, and their role as writers.

Research Methods

Research methods originated to study the composing process are diverse and imaginative. They range from interviews of writers both before and after writing, to observations of classes or of writers, to video or audio tapes of writers during the composing process. The subjects are grade school children to adults, novices to experts.

An overview of the kinds of approaches researchers use to understand writing is provided by Carl Bereiter and

Marlene Scardamalia.[9] They explain six levels of inquiry that move from the natural phenomena of writing (Level 1) to theories of writing (Level 6). Level 1, reflective inquiry, does not involve research, but rather contemplation of experience. Bereiter and Scardamalia view relective inquiry as a "home base. . . . the place from which other kinds of inquiry start" (p. 4). Typical methods of reflective inquiry are informal observation, introspection, and discussion. Level 2 is empirical variable testing. As its name suggests, this level tests the premises that might evolve from Level 1 inquiry, and the authors believe it should be used only as a supplement to Level 1 inquiry (p. 7). Methods of empirical variable testing are factorial analysis of variance, correlation analysis, and surveys. Level 3, text analysis, consists of discovering the rules or principles that people use when they write. According to Bereiter and Scardamalia, text analysis "approaches texts as complex phenomena that exhibit internal lawfulness, and it aims to understand that lawfulness" (p. 10). Level 4 inquiry, process description, concentrates on the process of composing rather than on the product. While Level 3 investigators search for lawfulness in writing, Level 4 investigators search for lawfulness in the protocols. Level 4 methods include thinking-aloud protocols and videotape recordings. Level 5 inquiry is theory-imbedded experimentation. It is closely related to Level 2 inquiry except that Level 5 research focuses on

theory rather than on procedure. Where Level 2 inquiry can exist without a theory (one can be formulated after the research), Level 5 cannot. Simulation is Level 6. Bereiter and Scardamalia define simulation as "investigating the nature of different composing strategies or composing abilities by trying to simulate them" (p. 20). Using simulation, researchers would construct a model of the composing process, present it to subjects, and note whether the subjects use the model to improve their writing.

The pioneer study of the composing pocess using Level 4 inquiry methods is Janet Emig's The Composing Processes of Twelfth Graders, published in 1971.[10] Emig's subjects were eight students with diverse demographic makeups. Her methodology included a combination of approaches. The students composed aloud--writing and verbalizing at the same time; they recounted their process in writing a specific paper; and they provided an autobiography of their writing.

An ambitious research project conducted by Christopher M. Clark and Susan Florio gives the results of a year-long study of writing in grade school.[11] In their research into the societal influence on the acquisition of literacy, their methodology was multifaceted. They observed and made videotapes of the two classes in their study while the classes were in session. They worked closely with the teachers of the classes, who wrote

journals and participated in meetings, viewing sessions, and interviews throughout the course of the academic year.

Sharon Pianko in her research studied the composing processes of college freshman writers. In her article "A Description of the Composing Processes of College Freshmen Writers," she explains her procedure.[12] She studied the writing of seventeen freshmen students who wrote five assignments. Each student was videotaped during at least one writing episode, and after this episode the student was interviewed about that assignment and about his views on writing generally. Each student also discussed the history of his writing experiences.

Suggestions for methods to study adult writers are presented in a study by Lee Odell and others.[13] Interested in exploring adult writers' tacit knowledge about writing, Odell and his coresearchers knew that some parts of a writing task require little effort while other parts are quite difficult. The easier tasks are probably achieved because of tacit formulation of how to perform that task, and Odell and his colleagues wanted to see if they could get at some of this tacit knowledge. One procedure in attempting to do so was to conduct a multiple choice test. Given a a sample letter, the subject had to choose between different words or sentences of different tones or purposes in specific sections in the letter. The experimenter could then discuss the subject's choices in an interview and perhaps lead the subject to reveal or discover his tacit

knowledge about the specific writing task. Another approach that they suggest involves studying samples of all the different written work people do in their jobs. In this way, the experimenter may be able to recognize trends or departures that the writer may never have been aware of. For instance, one supervisor used an alternate version of her name in writing to different audiences.

For an example of the case study approach, Thomas Newkirk provides an interesting account of his research involving students from a summer session freshman English class.[14] Newkirk attended the class and worked with the students and their instructor throughout the eight-week semester, assessing the students' attitudes and development. He discovered that students' views of themselves and their previous writing experiences greatly influenced their writing in college. He takes us through the process of development in the writing of one freshman student.

Charles R. Cooper introduces a wide range of approaches for cohesion analysis, abstraction levels, and others methods in "Procedures for Describing Written Texts."[15] He and others employ some of these methods in "Studying the Writing Abilities of a Freshman Class."[16]

Applying these new methods to the classroom is the subject of Jone Rymer Goldstein's "Trends in Teaching Technical Writing."[17] She attributes the new trends to a revolution that has been influenced by modern rhetoric,

composition pedagogy, and empirical research on writing. The modern rhetoricians, unlike their classical counterparts, see technical writing as rhetorical. According to Goldstein, the "consequence for teaching is that technical communication has been elevated from a lowly skill, a handmaiden of technology, to a vehicle for creating substance, as well as form" (p. 25). As for composition pedagogy, its new focus on the process rather than the product has been taken up by technical writing teachers. The empirical research that has been uncovering this process has added yet another dimension to technical writing instruction. Goldstein's article discusses the new teaching practices that have come about as a result of this revolution: intervening in students' writing processes, helping students understand their own and others' writing processes, introducing models of the writing process, teaching students how to discover what to say, assisting students in developing their own professional voices; alerting students to environmental considerations, and integrating the reader into the process. The discussion gives practical suggestions for implementing these practices into the classroom.

Thinking-aloud Protocols

The research method I used for my study involved thinking-aloud protocols. Linda Flower and John R. Hayes are well known for their seminal studies on analyzing these

protocols, and in "Uncovering Cognitive Processes in Writing: An Introduction to Protocol Analysis," they discuss the methods for conducting writing research, input-output methods and process-tracing methods.[18] Thinking-aloud protocols--along with behavior protocols, retrospective reports, and directed reports--are process-tracing methods. Their article compares input-output and process-tracing methods and outlines the advantages of using thinking-aloud protocols for writing research. For example, they assert that more can be discovered about the process of writing from observing students while they work rather than from making inferences from a written product. While performing a writing task, students give researchers clues about what is easy and difficult for them to write, how and when they rewrite or reformulate their ideas, and what their attitudes are about the subject or the writing itself. The thinking-aloud protocols provide so much information that sorting through them has become a major focus of research.

In a later article, "Designing Protocol Studies of the Writing Process: An Introduction," Heidi Swarts and Flower and Hayes give practical suggestions for how to conduct experiments and how to go about sorting out the data--parsing the protocol or written transcript of the thinking-aloud tape.[19] They discuss coding the protocols, a process that is dependent on the subject of the experiment. They also talk about the importance of a good

coding scheme and of graders who are familiar enough with it to come close to agreeing on the contents of the protocols. These taxonomies or coding schemes are highly important, for they allow the researcher to statistically analyze his data to prove a hypothesis or detect a trend in his area of interest.

Charles R. Cooper and Lee Odell were interested in writers' concern for the sound of their compositions.[20] They wondered if published writers consider what their writing would sound like if it were read orally, even when it was not intended to be read aloud. They wondered if these writers paid attention to the volume, pitch, or voice quality in their writing. They wanted to know how considerations of sound figured in the composing process. To what degree were these writers concerned about sound? At what stages of the writing process did considerations of sound manifest themselves? By conducting research with composing aloud and interviews, Cooper and Odell were able to make some tentative conclusions about sound in writing. They found that sound was not one of the most important considerations to the eight writers in their study; clearly expressing their ideas to readers was most important. However, sound was a significant consideration in the composing process of these writers, and Cooper and Odell were able to discover that information with the aid of thinking-aloud protocols.

Another fascinating area of research that has been

opened up with the advent of thinking-aloud protocols is pausing and planning. Ann Matsuhashi and Flower and Hayes were interested in what they could discover about writing from focusing on the pauses that occur during writing.[21] They made the assumption that writers plan strategy while they pause, but they wanted to know what kinds of planning they engaged in and if there were different kinds of planning. This research called for careful transcription of the protocols; the length of each pause had to be recorded. Matsuhashi was interested in comparing the pauses in compositions written for three different discourse purposes: to report, to persuade, and to generalize. Her findings suggested that generalizing and persuading were more time consuming than was reporting. She also found that abstract sentences take longer to compose than sentences that add detail. Furthermore, she determined that students choose unspecific words, like "thing," very quickly, as if they are not willing to spend the time searching for a more concrete word.

In their research, Flower and Hayes discovered that there are two types of planning: sentence level planning and whole text planning. Sentence level planning is the kind of planning people engage in when they speak, and poor writers rely on this kind of planning. Whole text planning, however, takes into account the rhetorical concerns of writing: audience, genre, purpose. Whole text planning is more complex than sentence level planning;

thus, Flower and Hayes hypothesized that the pause time during whole text planning would be longer than that during sentence level planning. The thinking-aloud protocols that they conducted for their research proved to be a perfect device to study planning. Flower and Hayes knew that time alone would not be the best indicator of which of the two kinds of planning the subject was engaging in, so they devised a system for marking episode boundaries, "units of concentration or periods of sustained focus" (p. 234). Their findings suggest that episode boundaries are related to rhetorical goals. In other words, sentence-level planning alone could not account for how writers write.

Other researchers have mentioned the value of using thinking-aloud protocols to study revising.[22] Yet another researcher who studies the fascinating problem of writer's block points out that it could be further explored by using thinking-aloud protocols.[23]

My own interest, however, has been in the area of organization. While most of the researchers cited have undertaken to observe their subjects while composing, my subjects' task was to reorganize pieces of scrambled writing while thinking aloud into a tape recorder. Probably the major differences between analysis of writers while composing and while organizing have to do with generating ideas about content. My subjects had to consider content and formulate a purpose, just as if they were composing; however, they were able to concentrate most

of their attention on ordering the sentences at hand. They did not have to consider context or global structure past the paragraphs they were given.

My view of organization takes into account three assumptions:

1. Organization is central to being able to reason. James Moffett's theory that abstracting represents learning (p. 147) suggests that organization might also play a part in learning to reason. In my view, learning to categorize (or organize) one's thoughts enables one to think in more and more complex ways. The ability to organize seems closely tied to the ability to sort out ideas, to formulate theories, to draw conclusions, in short, to reason.

2. Organization is a much more complex activity than most composition and technical writing textbooks suggest. These textbooks discuss organization in terms of outlining or in terms of creating text using different patterns of organization, such as comparison or causal analysis. The emphasis is on the <u>product</u> of organizing--creating an outline that ultimately leads to creating text--rather than on the <u>process</u> of organizing. Perhaps the textbook writers do not discuss the process of organizing because it is so complex and thus would take up too much space. Or perhaps they do not discuss the process because they do not see the process of organization as complex. My own view is that the processes involved in organizing are quite complex and that organization in writing encompasses a great many of

the elements of writing. For example, a writer has to organize every aspect of his writing: his thoughts in the planning stage and his sentences and words in the composing stage. And he may reorganize every aspect of his finished composition in the revising stage.

3. Organization is difficult to separate from meaning. Isolated facts or ideas, unless they are put together for some purpose, are meaningless. Textbooks suggest that students organize their information for a purpose, but the practice of providing a chapter on invention and a separate one on outlining breaks down the connection between meaning and organizing. The result is that organization is viewed as entering the process of writing only at one stage.

In conducting my experiments and assembling the results, I kept these assumptions in mind. I expected to discover some insights about the processes of organizing that support my theory that organizing plays a large role in reasoning. I hoped to find support for my theory that organizing is complex and wide-ranging and that it is tied to meaning. Conducting thinking-aloud protocols on an organizational task seemed certain to help confirm or reject some parts of the theories or at least to provide some new information on organizing. However, one of the problems of having high expectations for insights in reviewing thinking-aloud protocols, according to Bereiter and Scardamalia, is that subjects do not reveal any more

than what they are conscious of (p. 13). There are mental processes that subjects cannot reveal orally because the subjects are not conscious of them or because taking the time to express them would interrupt the task. Thus, subjects may be withholding clues about the complexity or organizing. Furthermore, the complexity of organizing may be difficult to pinpoint in the protocols because of a subject's tendency to put the most complex ideas into simpler units--that is, to classify, which is a common organizational method.

Evaluating the protocols, then, is the most difficult part of the process. The protocols will not, by themselves, provide insights into organizing, as Bereiter and Scardamalia point out, "Ultimately, it's the investigator's descriptions, not the subjects's verbal report, that must be judged true or false" (p. 13). It is up to the investigator to make the discoveries.

ENDNOTES

[1] James Moffett, Teaching the Universe of Discourse (Boston: Houghton Mifflin, 1968), p. 186.

[2] Donald M. Murray, "Internal Revision: A Process of Discovery," in Research on Composing: Points of Departure, ed. Charles R. Cooper and Lee Odell (Urbana, Ill.: National Council of Teachers of English, 1978), pp. 85-104.

[3] Janet Emig, "Writing as a Mode of Learning," College Composition and Communication, 28 (May, 1977), 122-127.

[4] Janet Emig, "Hand, Eye, Brain: Some `Basics' in the Writing Process," in Cooper and Odell, pp. 59-72.

[5] Sondra Perl, "Understanding Composing," College Composition and Communication, 31 (December, 1980), 362-369.

[6] Lee Odell, "The Process of Writing and the Process of Learning," College Composition and Communication, 31 (February, 1980), 42-50.

[7] Linda Flower and John R. Hayes, "A Cognitive Process Theory of Writing," College Composition and Communication, 32 (December, 1981), 365-387.

[8] Linda Flower and John R. Hayes, "The Cognition of Discovery: Defining a Rhetorical Problem," College Composition and Communication, 31 (February, 1981), 21-32.

[9] Carl Bereiter and Marlene Scardamalia, "Levels of Inquiry in Writing Research," in Research on Writing: Principles and Methods, ed. Peter Mosenthal, Lynne Tamor, and Sean A. Walmsley (New York: Longman, 1983), pp. 3-25.

[10] Janet Emig, The Composing Processes of Twelfth Graders, NCTE Research Report No. 13 (Urbana, Ill.: National Council of Teachers of English, 1971).

[11] Christopher M. Clark and Susan Florio with Janis L. Elmore, June Martin, and Rhoda Maxwell, "Understanding Writing Instruction: Issues of Theory and Method," in Mosenthal, Tamor, and Walmsley. pp. 236-264.

[12] Sharon Pianko, "A Description of the Composing Process of College Freshman Writers," Research in the Teaching of English, 13 (February, 1979), 5-22.

[13] Lee Odell, Dixie Goswami, and Anne Herrington, "The Discourse Based Interview: A Procedure for Exploring the Tacit Knowledge of Writers in Nonacademic Settings," in Mosenthal, Tamor, and Walmsley, pp. 220-235.

[14] Thomas Newkirk, "Anatomy of a Breakthrough: Case Study of a College Freshman Writer," in New Directions in Composition, ed. Richard Beach and Lillian S. Bridwell (New York: The Guilford Press, 1984), pp. 95-108.

[15] Charles R. Cooper, "Procedures for Decribing Written Texts," in Mosenthal, Tamor, and Walmsley, pp. 287-313.

[16] Charles R. Cooper, with Roger Cherry, Barbara Copley, Stefan Fleisher, Rita Pollard, and Michael Sartisky, "Studying the Writing Abilities of a University Freshman Class: Strategies from a Case Study," in Beach and Bridwell, pp. 19-52.

[17] Jone Rymer Goldstein, "Trends in Teaching Technical Writing," Technical Communication, 31, No. 4 (1984), 25-34.

[18] John R. Hayes and Linda S. J. Flower, "Uncovering Cognitive Processes in Writing: An Introduction to Protocol Analysis," in Mosenthal, Tamor, and Walmsley, pp. 206-219.

[19] Heidi Swarts, Linda S. Flower, and John R. Hayes, "Designing Protocol Studies of the Writing Process: An Introduction," in Beach and Bridwell, pp. 53-71.

[20] Charles R. Cooper and Lee Odell, "Considerations of Sound in the Composing Process of Published Writers," Research in the Teaching of English, 10 (Fall, 1976), 103-115.

[21] Ann Matsuhashi, "Pausing and Planning: The Tempo of Written Discourse Production," Research in the Teaching of English, 15 (May, 1981), 113-134; Linda Flower and John R. Hayes, "The Pregnant Pause: An Inquiry Into the Nature of Planning," Research in the Teaching of English, 15 (October, 1981), 229-243.

[22] Nancy I. Sommers, "Revision Strategies of Student Writers and Experienced Adult Writers," College Composition and Communication, 31 (December, 1980), 378-388; Lillian S. Bridwell, "Revising Strategies in Twelfth Grade Students'

Transactional Writing," Research in the Teaching of English, 14 (October, 1980), 197-222; Lester Faigley and Stephen P. Witte, "Measuring the Effects of Revision on Text Structure," in Beach and Bridwell, pp. 95-108; Richard Beach and Sara Eaton, "Factors Influencing Self-Assessing and Revising by College Freshmen," in Beach and Bridwell, pp. 149-170.

[23] Mike Rose, "Rigid Rules, Inflexible Plans, and the Stifling of Language: A Cognitivist Analysis of Writer's Block," College Composition and Communication, 31 (December, 1980), 389-401.

CHAPTER III

EXPERIMENTAL PROCEDURE

Experimental Design

The experimental procedure for my testing consisted of a pretest-posttest, and control and experimental group design.

Pretest-posttest

The pretest was administered the week of February 11, 1985, two weeks into the semester. The posttest was administered eight class weeks later, the week of April 15. In both tests, students were asked to organize two groups of randomly ordered sentences into paragraphs and to verbalize all their thoughts into a tape recorder while performing the task. During the eight-week interim between the tests, I delivered regular minilectures to the experimental group on aspects of organization.

Control and Experimental Groups

The control and experimental groups for my testing were composed of the students in the two technical writing classes that I taught at Marshalltown Community College (M.C.C.) in Marshalltown, Iowa, in the spring semester of

1985. Because of the possibility of experimenter bias, the choice of which class was to be the experimental group was made by flipping a coin. I began with 21 total students in the study (14 students from the control group and 7 students from the experimental group), and I ended the study with 14 students (10 students from the control and 4 from the experimental). I explained to both groups the subject of the experiment (to study organization skills), my purpose in conducting it (to write a master's thesis), and my requirements for them as participants. I did not explain to the control group that they were the control group and that the experimental group would be receiving minilectures on organization. The students in the control group never asked how I was differentiating between the groups. Before taking the pretest, all the participants signed consent forms (Appendix A) that stated that their participation would not affect their grades in technical writing and that their anonymity would be maintained in the resultant study. They also consented to have their ACT scores and grade point averages released for use in the study.

Choosing Samples

Criteria

The task of choosing information to be used in the experiment proved to be complicated one. Several factors had to be taken into account before deciding on a good

written sample for my testing. The first was that the sample could not be highly technical; my students' diverse backgrounds and majors necessitated that I choose a piece written for a lay audience. Secondly, the sample had to be written in paragraphs. Not surprisingly, I found the bulk of the literature from the companies I contacted to be in the form of lists of materials, equipment, or features, and procedural steps to put something together or to perform some task. Paragraphs in these brochures were limited to introductory paragraphs that were isolated and too brief or to warning or guarantee statements that were also isolated and too jargonistic for my purposes. A third consideration was that the length of the sentences and paragraphs had to be neither too long nor too brief for my participants to organize in 45 minutes. I wanted to challenge the students enough so that they would have to use much of the time allowed, but I did not want the weaker students to give up in frustration or to leave the test unfinished because of lack of time. (In fact, one student did not complete the pretest before his time ran out.) Coupled with sentence and paragraph length considerations was the need to have samples that were complete and meaningful by themselves--to have clear beginnings and endings. My aim was to give the students samples that achieved some purpose and give them a chance to reconize that purpose. Finally, the most obvious consideration was that the sentences and paragraphs had to be well organized.

Pretest Sample

Because of possible problems with copyright permission, I narrowed my search for appropriate literature to companies headquartered in Marshalltown. The people I contacted were cooperative, and all gave me copies of their technical literature to use. I decided on a sales brochure from Lennox Industries, Incorporated on the Lennox Pulse furnace for my pretest. The Lennox representative gave me permission to use the information in the brochure on the condition that whenever I refer to the Lennox Pulse furnace I use the full three words. The sections I chose from the brochure fit all the criteria outlined above.

I chose six paragraphs from the Lennox brochure to use in the pretest. I grouped four paragraphs consisting of ten sentences total into one exercise that I labeled "Group 1." These paragraphs compare the Lennox Pulse furnace with conventional gas furnaces in terms of heat loss and efficiency. They build up to stating the key feature of the Lennox Pulse furnace--97% efficiency. (See Appendixes B and C.) The two remaining paragraphs, which I used for Group 2, consist of six sentences each. These paragraphs explain the problems caused by condensation and by furnaces using indoor air for combustion. Again, the Lennox Pulse furnace is compared with conventional furnaces. The first paragraph discusses problems and the second outlines the

ways the Lennox Pulse furnace overcomes these problems. (See Appendixes B and D.)

Posttest Sample

For the posttest, I used the Marshalltown Community College 1983-85 catalog. I wanted to choose a sample that was less technical than the pretest, for some of the students remarked, in their pretest protocols, about having difficulty because they were unfamiliar with the subject matter. I suspected that some students were quite hampered by the subject matter and that their performance would be much better with a different subject. Another problem arose as I was looking for a sample that did not discriminate against the less technically inclined of my students: All the general audience material seemed too simple. My criterion about challenging the students was going to be hard to meet with this simpler, less technical material. I had chosen the pretest samples because I thought the paragraphs were well organized and the sentences complex enough to force the students to spend time sorting out each one and then piecing them together. But, in the posttest I took a different approach. I chose descriptions of the Adult and Continuing Education program (Group 1) and the Learning Resources Center (Group 2) from the catalog because they provided a different kind of challenge. (See Appendixes E, F, and G.) In both cases, the descriptions consisted of paragraphs that could be easily

interchanged. The order within the paragraphs in most cases could not logically be changed, but the order of middle paragraphs certainly could be changed. The challenge for the students, then, was to look for a plan that probably did not exist for organizing these middle paragraphs.

Pretest-Posttest Experiment

Layout of Test Sheet

The pretest and the posttest consist of three pages each. The first page of both tests is identical. It contains an introductory paragraph and a procedure section. The introductory paragraph instructs the students to verbalize all of their thoughts into the tape recorder and stresses that I am particularly interested in what they are thinking while they are organizing. The procedure section tells the students that they have a time limit of 45 minutes. It directs students to "organize the randomly ordered sentences . . . into one or more coherent paragraphs" and to repeat the procedure with sentences marked "Group 2." The instructions remind students to "say everything out loud" and to "Be sure to indicate where new paragraphs begin." The instructions also direct students to put their names on all the written material and on the tape. The instruction page ends with another reminder to students to think aloud into the tape recorder. (See

Appendix H.) Pages 2 and 3 of the pretest and posttest are Groups 1 and 2 respectively. I randomly scrambled the order of the sentences, typed them, and left a line to the left side of each for students to use in reorganizing.

Testing

The pretest and posttest were conducted in six private conference rooms in the M.C.C. library. Each conference room was equipped with a portable tape recorder, containing a 90 minute blank cassette tape; a copy of the pretest or posttest; and several sheets of blank paper. Students had a time limit of 45 minutes (one side of the tape) to complete the exercise. I guided each student to a conference room, briefly explained the procedure, and reminded each one that my chief interest was in what he or she was thinking while performing the experiment.

Scoring

The scoring of the students' pretests and posttests presented a problem. The sample lengths varied from 10 and 12 sentences in the pretest to 13 and 9 sentences in the posttest. While the sentences in the pretest seemed to have one best arrangement, the sentences in the posttest did not.

Original Pretest Scoring System

I devised a scoring system for the pretest before I

chose samples for the posttest. I originally thought that the best way to accurately evaluate the students' organizing skills was to calculate how much their arrangements disagreed with the actual arrangement. For example, if the actual first sentence was marked #9 in the student test, the number off was 8 for that sentence. A perfect score would be 0, and the higher the number, the worse the arrangement. With this system, if the student had sentences transposed or close to the actual number, he would be penalized but not as much as a student who is not even close to the actual. I made a chart for each student that listed his numbers, the actual ones, and the number off.

Revised Pretest Scoring System

While I was making the calculations, I started seeing some trends develop. Students were scoring much better on Group 2 with its 12 sentences than on Group 1 with only 10 sentences. I also noticed that many students were marking the actual fifth sentence in Group 1, "This kind of efficiency translates into big savings for you on the bottom line of your heating bill," as #10. And in Group 2, the actual second sentence, "This can pose a potentially serious problem," was rarely marked as #2. (Only one student of the 14 in the experiment marked #2 as #2.)

I looked at the Lennox brochure again and saw that in Group 1 the first two paragraphs are concerned with

temperature and the last two with percentages of heat loss. While both have to do with efficiency--the key word in sentence #5--the word efficiency is never used in the first two paragraphs (where sentence #5 actually appears). However, the word efficient is used three times in the last two paragraphs. Even though the sentence does not read well as #10, the students must have been swayed by the repetition of the word efficient in the last paragraphs, and they put #5 as #10 because the sentence reads like a last sentence of a paragraph.

In Group 2, the first paragraph outlines the compound problems of indoor air and condensation. Yet sentence #2, "This can pose a potentially serious problem," appears just after the first sentence, "Most competitive high efficiency gas furnaces use indoor air for combustion." Nothing has been said about condensation or how it acts to compound the problems caused by indoor air. The students were quite logical in choosing to put sentence #2 after the entire list of problems. I also noticed that sentence #6, which is a lengthy sentence detailing the ways heating systems can be damaged, could easily be put in another place. A new scoring system had to be devised to take these discrepancies into account.

The new plan still used the number off system but with one alteration. The sentences that could logically fit in another place were removed from the scoring. These "wild cards" were actual sentence #5 in Group 1 and actual

sentences #2 and #6 in Group 2. This new system called for all the student numbers and actual numbers to be altered to reflect a sequential order after the wild cards were removed. Therefore, if a student marked #5 as #10 in Group 1, his numbering did not change, but in all cases the actuals moved up by 1 from #6 through #10.

Final scoring system

When I chose the posttest samples, I knew that the number off system with wild cards was not going to work. There were too many wild cards in the posttest samples. Because the order of sentences within the paragraphs was fixed, I needed a system to evaluate performance within paragraphs rather than the sample as a whole. Also, in both Groups 1 and 2, the first and last sentences were fixed. I needed to devise a new plan that judged the students on these criteria only. The problem arose of how to equalize the figures. Two different scoring systems were going to produce different results. While the number off system of the pretest could not be applied to the posttest, the reverse was not the case. The criteria system devised for the posttest could be used for the pretest.

The final scoring system judges each group of sentences from pretest and posttest on a standard set of six criteria:

Criterion 1: In each group, the actual first sentence had to be #1. I deducted 4 points for an incorrect answer.

Criteria 2, 3, 4, and 5: For each group, I chose 4 pairs of sentences that had to be in order. To add some depth to my scoring system, I deducted 4 points for an incorrect answer; 2 points for transposed numbers; and 2 points for numbers in order but off by one. None of the sentences that I considered wild cards was included in the criteria system.

Criterion 6: In each group, the actual last sentence had to be last. I deducted 2 points for an incorrect answer.

The criteria system adds up to a possible 22 points off for the worst performance or 0 for perfect performance in each group. The total of all four groups would add up to 88 points off for the worst performance and 0 for perfect performance.

Minilectures

During the eight weeks between the pretest and posttest, I gave minilectures on organization to the experimental group. The minilectures took up about the last 15 minutes of each class period. The class met twice a week, making a total of 16 minilectures or four hours. The actual amount of time the class and I discussed organization was more than four hours because we often continued the discussion informally for 10 to 15 minutes

after the class period ended.

My goal for the minilectures was twofold. First, I wanted to give the students a good grounding in different organizational schemes employed by writers. Second, I wanted to introduce them to different ways of organizing things other than writing. I thought that if I could pique the students' interest in organizing, they would retain more from the lectures about organizing.

The minilectures consisted of five different approaches:

1. Textbook lectures on organizational schemes
2. Textbook lectures on outlining
3. Textbook exercises on organization and outlining
4. Logic games
5. Informal lectures on organization in life

Textbook lectures on organizational schemes

The lectures on organizational schemes were developed from chapters in technical writing and composition textbooks, particularly our course textbook, Houp and Pearsall's Reporting Technical Information, 5th edition, and James McCrimmon's 8th edition of Writing With a Purpose, the required textbook for composition courses at M.C.C.[1]

In gathering information for the minilectures, I noticed that textbooks writers do not agree on what constitutes rhetorical methods or on what name to give

them. For instance, Houp and Pearsall discuss four "basic modes of discourse": exposition, narration, description, and argumentation. McCrimmon, on the other hand, has a chapter on "common methods of development," which consists of narration, description, illustration, comparison, classification, process analysis, causal analysis, and definition. McCrimmon has a separate chapter on persuasion, which he states is "closely allied with argument" (p. 329), but he does not put persuasion under the heading of "methods of development"; it is a chapter in the part of the book titled "The Expression of Ideas," along with chapters on the methods of development, paragraphs, sentences, diction, and tone and style. Interestingly, Houp and Pearsall state that the modes of discourse are "strategies that enable you to present your material in a persuasive way" (p. 99). Furthermore, Houp and Pearsall discuss the "rhetorical devices" as techniques for organizing expository papers. Their rhetorical devices are topical arrangement, exemplification, definition, classification and division, comparision, and causal analysis. The lack of agreement about organization of written discourse was clear, so instead of choosing between the two, I presented all the information to the students. They debated the reasons for the inconsistencies and presented their preferences for the most logical system of viewing organization.

Textbook lectures on outlining

Closely related to the textbook lectures on organizational schemes were lectures on outlining. Throughout my tenure as a college instructor, I have noticed that many students do not recognize the relationships between and among ideas. They will often read a chapter, for instance on rhetorical methods, and fail to realize that each of the three sections of the chapter deals with one type of rhetorical method. They can remember a number of specific facts in the chapter, but they often have no concept of how those facts fit together in a general scheme. Talking about outlining seems to be the most basic way of explaining how ideas relate to one another. In the minilectures, we compared ideas that were in list form to the same ideas put in outline form. We looked through tables of contents and discussed what we knew about each chapter without reading it. The students were amazed at how much we could predict about a chapter's contents--from arrangement to the thesis statement of the chapter--just from reading the table of contents.

Textbook exercises on organization and outlining

The third approach tied in perfectly with the textbook lectures on organization and outlining. Many of the textbooks I used for the lectures provide exercises to go along with them. For organization, there were exercises on recognizing a rhetorical method or an arrangement.

Sometimes, we read chapters out of our textbook, Houp and Pearsall's Reporting Technical Information, and discussed their arrangement. Some of the exercises had poorly organized paragraphs, which the students became quite good at recognizing and altering. For outlining, the textbooks offered several facts or ideas that could be rearranged to suit different purposes. And they presented faulty outlines, some of which were challenging to work with because of the complexity of the subject matter or of the outline itself.

Logic games

Another aspect of good organizing is logical thinking. I used logic games to expose the students to this subject. These games take the form of scenarios that students have to sort through or statements that confuse the students because of assumptions that they are making about the statements. I sometimes divided the class into teams to see who could find the answer first. I put the major emphasis on how they were arriving at the answer rather than on the answer itself. Not surprisingly, the students engaged in arguments over the right way or the quickest way to play these games. What began as arguments from these unyielding students about their methods soon grew into acceptance of and interest in different ways of thinking. While the games may not have helped the students in

learning to organize better, their awareness of logic and its connection to organizing was certainly heightened.

Informal lectures on organization in life

The fifth approach overlaps with all the other approaches. I repeatedly applied organization to daily life. When we talked about geographical arrangement, I brought up the fact that I always organize the states from east to west, starting with Maine. One student said he always starts with Iowa and goes out to the west and circles around. Some of the other students said they always organize the states alphabetically. When I asked students if their rooms or homes were organized, most said no. But when I asked if they kept underwear and silverware in the same drawer, they started seeing that they were organized. All the talking about organizing in life led the students to wonder whether the best students were also organized people. The students were intrigued by the idea that having one's life and ideas organized made one seem intelligent and capable. Finally, the students were seeing some value to organization, and they were eager to talk about it.

In all, the minilectures covered a broad range of topics and techniques. My goal of interesting the students was also met, for the students came to look forward to each new minilecture.

ENDNOTE

[1] Kenneth W. Houp and Thomas E. Pearsall, Reporting Technical Information, 5th ed. (New York: Macmillan, 1984) and James McCrimmon, Writing With a Purpose, 8th ed. (Boston: Houghton Mifflin, 1984).

CHAPTER IV

RESULTS OF STUDY

This chapter begins with students' demographic statistics, followed by their test scores and recording times, for both individuals and groups. The rest of the chapter is devoted to analysis of the students' protocols.

Demographics

My study was completed with 14 students from two technical writing classes that I taught at Marshalltown Community College in Marshalltown, Iowa, in the spring semester of 1985. Of the 14 total students, there were 13 males and 1 female. The experimental group consisted of 4 students, ranging in age from 19 to 38, with a mean age of 28.75. The control group consisted of 10 students, ranging in age from 19 to 43, with a mean age of 22.1. The mean age of both groups was 24 (Appendix I). The number of years since high school or G.E.D. for the experimental group ranged from 1 to 20, with a mean of 10.75. The mean number of years since high school for the control group was 4.2 and ranged from 1 to 25 years (Appendix I).

The mean college grade point average of the experimental group was 2.2 on a four-point scale. The mean

college grade point average was 2.8 for the control group. The mean grade point average for both groups was 2.6 (Appendix J). The experimental group mean for high school grade point average was 2.2. The mean for the control group's high school grade point average was 2.7; however, I did not have access to 4 of the 14 students' high school averages. The overall mean was 2.6, which is quite close to the college grade point averages (Appendix K). I recorded the A.C.T. scores and college English courses and scores for the students (Appendix J), but there were too few to generalize. I also recorded high school English courses and scores for the students who had high school transcripts on file at the college; however, the variety of names used for English course kept me from making any judgments about language ability across the groups (Appendix K).

There were three different majors represented by the participants in the study. The experimental group consisted of 1 electronics major, 2 drafting majors, and 1 arts and sciences major. The control group consisted of 6 electronics majors, 2 drafting majors, and 2 arts and sciences majors (Appendix I).

Test Scores

Chapter III explains how the answers on the experiments were scored. There was a total of 22 points off possible for each group, for a total of 88 points off

possible in both the pretest and posttest. In the pretest, the experimental group averaged 14 points off for both Groups 1 and 2, for a total of 28 points off out of 44 possible for the pretest. The control group, in the pretest, averaged 13 points off for Group 1 and 12.6 points off for Group 2. Their total pretest average was 25.6 points off out of 44 possible (Appendix L). In the posttest, the experimental group averaged 10.5 points off for Group 1 and 11 points off for Group 2, for a posttest total of 21.5 points off out of a possible 44. The control group, in the posttest, averaged 14 points off for Group 1 and 12.4 points off for Group 2, for a total of 26.4 points off out of a possible 44 points in the posttest (Appendix M).

The experimental group's 4 members all improved in their point counts. As a group they decreased their points by 26, from 112 points off in the pretest to 86 points off in the posttest. In the control group only 4 out of 10 made improvement in the posttest. Their total score for the pretest was 235 points off, while in the posttest, it was actually higher--274 points off.

In order to see the results in terms of percentages, I manipulated the scores so that 0, which originally represented a perfect score, would have the value of 100%, and 88, which represented the total number of points off, would have the value of 0%. In terms of percentages, then, the experimental group pretest score was 36.36%. The

control group pretest score was 41.82% (Appendix L). Thus, in the pretest the control group performed 5.46% better than the experimental group. The percentages are reversed in the posttest. The experimental group had an average of 51.14%, while the control group average was 40% (Appendix M), for a difference of 11.14%. The experimental group thus improved their totals by 14.78%, while the control group's scores dropped by almost 2%.

Time

I recorded the amount of time it took each student to complete his experiment, from the beginning of taping until the end. I asked the students to read the instruction sheet first and begin taping as soon as they turned to the scrambled sentence groups; however, the beginning of some of the protocols suggests that some of the students may have read the sentences for a minute or two before turning on the recorders. The experimental group spent an average of 30 minutes taping their exercises, with times ranging from 12 to 45 minutes, the time limit (Appendix N). The control group average was almost identical at 30.1 minutes, with a range of 11 to 45 minutes. The average of both groups was 30.07. Both groups averaged less time on the posttest. The experimental group spent an average of 24.75 minutes taping the posttest, with a range of 6 to 45 minutes. The control group averaged 17.7 minutes, with a range of 10 to 28 minutes. The average of both groups on

the posttest was 19.71 minutes, or 10.36 fewer minutes on the posttest. The experimental group spent 5.25 minutes less on the posttest, while the control group spent 12.4 minutes less. Individually, each student spent less time on the posttest, except for the extreme cases. One student who spent 45 minutes on the pretest also spent the maximum of 45 minutes on the posttest. The student who spent the least time on the pretest, 11 minutes, took 12 minutes to tape the posttest.

Protocol Analysis

I typed all the transcripts of the taping sessions, the protocols. The protocols from the pretests were double spaced with an abbreviation system for the sentences when read in full in the groups. For the posttest, I changed my typing format by single spacing everything that seemed to follow one thought pattern and then double spacing to show a transition, in effect, paragraphing. It is much easier to read the protocols with thought groups marked as paragraphs. For example, if a student could not settle into a pattern or stay on track with one idea, his protocol showed single lines broken by double spacing, whereas a student who continued with an idea for several sentences would have several single-spaced lines separated by double spacing. One can quickly see whichever of these two categories a student fits in. As for knowing when to change paragraphs, I was guided by practice, for one thing,

for I had already typed and read and reread the pretest protocols. Also, I changed paragraphs when there was a significant pause, significant being around 5 seconds, depending on the student. I also came to notice certain verbal signals, such as "Oh, no" or less polite phrases that let me know that the student's strategy was not working. These lead to new paragraphs.

I had the help of three other persons, all of whom teach college English, to read the protocols. I asked these readers to give me their impressions about what they found in the protocols. I did not want to tell them that I had been formulating categories or what those categories were; rather, I wanted to see if their impressions, both general and specific, matched mine. As for specifics, the markings on the protocols were in the same places as mine, but they sometimes used different terminology. For instance, where I wrote "classification," one of the readers wrote "correlation." In all cases, the readers marked specific sentences or groups of sentences only and did not give any clues about a general assessment of a student's overall performance on a protocol. The readers did have some general ideas about teaching implications or research implications that came out in informal discussions on the subject of organizing and they thus expanded my views on the subject.

I compiled a list of characteristics of the protocols, using the readers' suggestions and my own notes. My next

step was to devise a taxomony for evaluating the protocols, which proved to be an arduous task. My readers and I had found so many diverse things in the protocols that I wanted to find a place for every one of them. To add to that, I found that some characteristics that I thought were important were not. For example, I marked "topic sentence" on several of the protocols, at first thinking that the students who used that terminology must be verbally oriented. However, when I found that almost every student mentioned topic sentences, I realized that "topic sentence" is not really a very technical term and that almost everyone would start an assignment at the beginning and thus with a topic sentence. I had to decide which of the characteristics described the process of organizing, and I had to put them in categories that suggested the range of the organization process. I decided on just two categories: behavioral characteristics and developmental strategies.

Behavioral Characteristics

Under the heading of Behavioral Characteristics, I put reading, sound, writing, verbal signals of performance, and anomolies. Behavioral characteristics are the kinds of things that a person does when performing any oral exercise; they are that person's particular style in the general areas of reading and writing, listening and talking.

For the category of reading, I devised four exclusive ways that a student reads the test. By reading, I mean how students read through the groups of sentences that are the subject of the experiment. It is a general category, in the sense that the assessment of which of the four a student uses is determined by reading through the whole protocol. The four ways of reading the protocol are as follows:

1. W--reads the whole group through at the beginning.
2. S--skips around through the group and reads only parts of sentences.
3. R--rereads sentences many times throughout the exercise.
4. D--does not read sentences.

I found that in the pretest, rereading the sentences is the most widely used method of reading the test, with 6 of the total 14 students using this method (Appendix O). However, in the posttest rereading drops to 5 of 14 and the method of skipping and reading only parts of sentences replaces it as the most popular, with 6 of the 14 choosing this method. In the pretest, only 4 students chose the skipping around method. The two remaining methods of reading the whole group to begin with and not reading at all are used only twice each in the pretest, and in the posttest only 2 students chose the no-reading method and only 1 student used the whole-group method. In the case of the two students who did not read the sentences at all, the

same method was used for both pretest and posttest. In other words, they did not alter the way they performed the experiment in terms of reading.

The second category concerns the implications of sound. I divided the category into two parts: (1) depending on sound as a way to determine topic and concluding sentences, and (2) depending on sound to determine whether a suggested arrangement is correct. "Sound" in this category refers to volume, pitch, and emphasis; in short, the vocal quality a written piece would have if it were read aloud. I can think of instances when I have read aloud something I am writing to try it out or see how it sounds even if it is not meant to be read aloud. In a research study using thinking-aloud protocols and other research techniques, Charles Cooper and Lee Odell found that sound is an important consideration in the writing of professionals.[1]

In organizing pieces of scrambled text, I believe that sound might be even more important or at least useful to the students. Some of us have a notion as to what a topic sentence or introductory sentence should sound like and what a concluding sentence sounds like even apart from content. For example, Lewis Carroll's "Jabberwocky" makes some sense to us even though Carroll uses nonsense words, because those nonsense words are in correct syntactical form for their function in the sentence.[2] The line "Twas brillig, and the slithy toves" sounds like an English

sentence. The key word here is sound, for students can and did determine topic sentences by their sound as well as decide on the correctness of the arrangement of the entire paragraph.

The students' protocols contained clues to their use of sound to help them determine their arrangements: "So let's hear that." "See how that sounds." "Sounds like a closing sentence." All of these were common phrases in the protocols. The students may have been depending on a developmental strategy to figure out the order of the sentences, and many of them may have been using the word "sound" metaphorically. They could have said, "Let's see how that goes, or looks, or reads," rather than "sounds." But many may also have made the final choice on the basis of the sound. One student said more than once in rereading, "No, that doesn't fit. Try it again." Another student said, "I'll have to read it again; make sure I'm getting it." In these instances, the students made the statement about sound and then read the sentences through in the suggested order with the pitch changes and emphasis that are common in speech. The statistics show that 9 out of 14 students considered the sound of the topic and concluding sentence in choosing them in the pretest, and 7 out of 14 students considered the sound of the whole group (Appendix P). In the posttest, only 5 out of 14 considered sound in choosing the topic sentence, and 8 out of 14 considered sound in deciding on the whole group

order. The lower number for the posttest for sound in the topic and concluding sentence could be explained by the fact that the topic sentence was quite obvious in the posttest. Students tended to notice the topic sentence in these groups right away. In fact, only 1 of the 14 students did not list the topic sentence of both Groups 1 and 2 as the topic sentence.

The third behavioral characteristic is writing. In this category, my original hypothesis was that students who write out their sentences would not also reread the sentences over and over. In other words, the students who write out sentences would depend on the "look" rather than the "sound" of a sentence. I suspected that my predominately technical students would overwhelmingly choose to write out their sentences, to have a visual, graphic representation of each one. This supposition, however, was not correct. In fact, only 4 students of the 14 wrote out sentences in the pretest, while only 1 student in the posttest wrote out sentences (Appendix Q).

The fourth category, vocal signals of performance consists of four parts: frustration, satisfaction, meta-comments, and pauses. This category gives a more detailed representation of what a student actually does while performing the task. The vocal signals of performance provide insight into the students' thought processes while they are organizing in unique and telling ways, some obvious and some not so obvious.

The categories of frustration and satisfaction can be considered together. Many of the students expressed both frustration and satisfaction at some time; however, 9 out of 14 students expressed frustration in the pretest compared with 5 out of 14 in the posttest (Appendix R). The differences here tell me that students either did not experience as much frustration in the posttest or that fewer students expressed their frustration the second time around. I tend to believe that the former is more likely because of the time spent on the posttest and because of the scores on the posttest. It is clear from the amount of time students spent on the posttest compared with the time they spent on the pretest--about 12 minutes less--that the experiment was not as challenging, which have had nothing to do with the test itself but with the attitude of the students.

The students' scores on the posttest tend to support my assertion that students probably had a different attitude in taking the posttest. First of all, the control group scored slightly lower on the posttest than on the pretest, yet the experimental group scored higher. Secondly, the control group spent much less time on the posttest than did the experimental group. Thirdly, fewer of the experimental group expressed frustration in the posttest. I believe that students have to be serious about a task to be very frustrated by it; that is, if students do not care about their performance, they will probably not

become frustrated. However, fewer of the experimental students gave verbal signals of frustration as well. Because those students spent only 5 minutes less on the protocols, compared to 11 minutes less for the control group, and because they scored much higher, I attribute their lack of frustration to self-assurance. They must have felt better able to handle the task after 8 weeks of minilectures, and their scores proved that they were. Another variable is the fact that any student would feel less apprehensive, thus less frustrated, while performing a task for the second time.

As for satisfaction, the incidence of verbal signals to express satisfaction is lower than that of frustration. Only 5 of 14 students in the pretest and only 4 of 14 students in the posttest gave verbal signals of satisfaction (Appendix R). These figures suggest two things: First, because verbal signals of frustration and satisfaction represent the same kind of behavioral characteristic--they are opposites--the higher incidence of frustration suggests that students were frustrated more than satisfied with their performance. Secondly, the overall low incidence of verbal signals of satisfaction suggests that most of these students, the 9 or 10 who did not express satisfaction, tend not to verbalize their thoughts. To me, the most natural kind of verbalization in these protocols would be to express satisfaction upon finding an order that fits, such as "That´s great" or "That

sounds good." However, most of the students do not use these phrases or even shorter ones, such as "Okay" to express satisfaction. They use "Okay" as they would use "Uhh" or any filler, as the protocols themselves prove. The bulk of most of the students' protocols contain verbalizations of the sentences and of statements like "I think 5 should be #1" or "I'll put that last," rather than statements about their thinking processes or expression of satisfaction. Only 1 of the 14 students explained what he was thinking while performing the task, with phrases such as "I'm classifying by what the topic sentence suggests in #9. I think I'll try to arrange my sentences in the order they talk about in #9." No other student consistently talked about what he was thinking or trying to do in the tests.

The third category is meta-comments, which Swarts, Flower, and Hayes define as "remarks that do not relate to the assigned topic and are often concerned with the situation or process itself."[3] Students who made meta-comments in the pretest and posttest were few in number, 4 of 14 in the pretest and 3 of 14 in the posttest (Appendix R). The meta-comments, as Swarts, Flower, and Hayes suggest, were often about the students' thoughts on performing the task: "It's hard when you're just looking at something and not sitting there typing it out." Another type of meta-comment began as a verbalization of a student's thoughts on performing the task and then became

thoughts about test taking in general in the pretest:

> I have the same problem here I have on tests. I hurry because I´m being timed or something. I don´t know. It´s weird. Not weird, it´s uncomfortable. I work better without any pressure. I also work faster without any pressure. I guess when the pressure is within me, it doesn´t bother me as when it is from without, forcing me to get it done. Now, I´m babbling, not making any sense at all. I´m only taking time to read some of this quickly and not making any sense of it.

The student (Student C) who recorded this spent the maximum of 45 minutes on the tape. This passage is representative of his protocol on the posttest. Out of the 85 total lines in the posttest transcript, this student devoted 56 lines to meta-comments of this type. Student C is an anomoly because he is the only one to spend more time on meta-comments than on reading the sentences or talking about his choices. The other students who gave meta-comments used them only rarely. Student A had only one meta-comment in either test: "Boy, this one is really hard. Trying to group these sentences into paragraphs or make them flow together because they all seem so independent of each other." Student M interrupted his protocol with this statement: "Just to sit here and talk at the same time is kinda boring. I´d rather not talk and think about it, I guess." The difference between these students and Student C, who talked about test taking, is that Student C spent most of his time on meta-comments, whereas the other students spent very little of their time on meta-comments.

Student A, for example, spent only 2 lines in meta-comment out of a total of 206 in the posttest, and he had no meta-comments in his pretest.

Another difference is that Student C abandoned the assignment completely in both the prestest and posttest and by the end only verbalized in meta-comments. He digressed more and more until he completely forgot the assignment in both tests. I attribute his plethora of meta-comments to frustration with the assignment and inability to concentrate. His thought patterns are obvious in this very short passage:

> I'd rather talk than write. That'd be more interesting. This applies to an electric furnace. I think I'll change over to electric so that I don't have to worry about it. (Mumbling.) Efficiency high--that'd be about a 35-year-old furnace. I wonder if we'll get points off for not being able to spell. I know why your pipes burn out on your furnace all the time. It's the 450 degree heat.

In this passage, Student C tries to get back on the subject, but in the course of one sentence he again digresses. It is difficult to follow his thought processes except for seeing that he cannot keep himself from letting his mind wander. At least in this passage from the pretest, the student tries to return to the assignment. By the posttest, however, he completely abandons the assignment while he is running the tape.

The fourth category is pauses. I put it under the heading of vocal signals of performance because it tells us the same kinds of things about behavior as the other three

vocal signals. A pause was marked only if it lasted a significant length of time, at least five seconds. Students were designated as pausing only if they paused a fair number of times, at least more than three times. Generally, a student who paused did so throughout the exercise, although the students who paused in the pretest were not necessarily the same ones who did so in the posttest. 5 out of 14 students paused in the pretest and 4 out of 14 in the posttest (Appendix R). One of the assumptions that I made about pausing before I tabulated the results was that students who paused would not be the same ones who depended on sound to help them organize. The pausers would not be the kind of students to repeat over and over the sentences in hopes of hearing the right order. There were two students who paused in both pretest and posttest, Students G and M. The other students who paused did not use the technique in both tests. Therefore, it is safe to say that for Students G and M, pausing is one the of behavioral characteristics that they felt comfortable using in both tests. My assumption about sound is also supported by these two students. Neither student in either test depended on sound to help him organize. Furthermore, both students were marked as using the skip-around method of reading, although Student G was marked as a repeater in the pretest.

Identifying what was going on during the pauses was harder to do than deciding which students were pausers.

Ann Matsuhashi and Linda Flower and John Hayes have researched the nature of pauses with the use of thinking-aloud protocols recorded while their subjects were composing.[4] Their findings that different kinds of planning go on during these pauses were apparent by reading the transcripts. The nature of the pauses in my protocols on organization is a bit less obvious. Taking a look at what students said after a pause is the only way to determine what they were thinking. The most general assessment I can make about the nature of pausing in these protocols is that the students were using the pauses to do their thinking rather than verbalizing their thoughts. Students G and M use their pauses to read to themselves and to sort out the sentences in their minds. Student M says after a long pause, "I´m reading to myself." Student G often takes a long pause and the next thing he says summarizes his thoughts: "Okay, it´s talking about different kinds of programs." Unfortunately, the only thing I can really discern about these students´ thought processes is that they cannot think while they are talking. They differ from the bulk of the students in the study, for the others were able to verbalize something all the time.

I formed a category consisting of two anomolies: repeating the end of a sentence and explaining after organizing. I included them for two reasons. First, I thought that the two characteristics they describe show significant departures from the norm and, two, that

comparing the departures with the norm provides some insights in the process of organizing.

Only one student repeated the end of a sentence, Student H, and he used this procedure only in the pretest. This procedure seems to correlate with students´ reading a sentence over and over. While Student H was reading a sentence and then repeating the end of that sentence, other students were reading entire sentences or repeating the beginning of a sentence. I surmised that Student H must have been repeating the end of a sentence because he was looking for the sentence that would sound best after it. This assumption would suggest that Student H depended on sound in the pretest, and that he did. He relied on sound for both topic and concluding sentences and for whole group organization. Another corollary to this procedure is that repeating the ends of sentences suggests a sequential plan for organizing. In effect, the student would find the first sentence, then the next, then the next and so on. On the other hand, the students who repeat whole sentences or the beginnings of them might be looking more at the meaning of the sentences and what other sentences they might logically go with.

Repeating the ends of sentences could also be Student H´s way of continuing to talk while thinking of where to put that sentence or of what to do next. In listening to the tapes, the repetition of the ends of sentences, as in Student H´s, or of the beginnings of sentences, as with the

other students who verbalized sentences, sounded slower, less emphatic, almost as if the speech were monotone. All these utterances sounded so different that I took notice of them right away. I believe that these repetitions mark the places where the students are formulating their ideas for the order of the sentences. This excerpt from Student H's protocol exemplifies my point: (The material in quotation marks is from the sentences on the pretest.)

> "That's because the Pulse extracts more heat from the same amount of gas." 5. ". . . more heat from the same amount of gas. Okay. Conventional. Okay, go from "Some heat loss is inevitable, but why continue to lose 45% when you can cut that heat loss to a minimum of only 3%." 4. "45%." Okay.

In the excerpt, Student H says a sentence, then he repeats the end of a sentence, then he says "Okay," signalling that he's found a place for that sentence or discovered a way to arrange the sentences.

The second anomoly is explaining after organizing. Only 2 students used this technique. Student H used it in the pretest, and Student J used it for both tests. I think it is worthy of mention because it points up the differences between these two students and the others. It shows that Students J and H paid attention to the process they went through while performing the task; they tried to verbalize what their minds were doing, even it they did so after the fact. It further shows that they were probably concerned with the outcome of the experiment; they seemed

to want to help me find out all I could about organizing. They knew that they did not verbalize that much of their thoughts during the experiment, so they must have tried to rectify that by voicing as much of their strategy as they could at the end. The other students either did not consider verbalizing their inner thoughts or they assumed that I could make assumptions about the writing process simply from studying the ordering and methods revealed by what they did verbalize.

Developmental Strategies

The developmental stategies category consists of two parts: strategies of the student and of the texts. The developmental strategies section concerns the way students go about ordering the sentences. It includes the developmental techniques a student might use to sort through the sentences in search of the best arrangement. The strategies of the student and of the text are considered separately because they suggest quite different things about the students. For example, all the students reveal some sort of developmental strategy whether they are conscious of it or not. However, not all students think about the text's purpose and arrangement. Yet, the students who do consider the strategies employed in the texts reveal more about their own strategy.

The first group of strategies, those the student employs, are made up of classification, process of

elimination, sequential organizing, paragraphing, and paraphrasing.

The first strategy, classification, covers a wide range of techniques: correlating words or ideas, recognizing the subject of the text and grouping, and noting comparisons. I have grouped them in one category because they are closely related and seem to suggest several levels of the same strategy. Generally, all these techniques suggest that a student is sorting out and combining ideas to determine their arrangement in paragraphs. In deciding whether to categorize a student as a classifier, I did not look for an instance of just one of the techniques, such as correlation of grouping. Students had to use one technique more than once or they had to use more than one technique. The pretest total of students who classified is 10 out of 14 students; the posttest total is 7 out of 14 (Appendix S).

Correlating words or ideas was quite common in the protocols. The students who used this technique immediately noticed special words that were repeated in other sentences. For example, in the pretest, "82 AFUE" is a phrase that appears in two separate sentences. Students commonly made the statement that "1 and 5 go together" even though they usually did not mention the "82 AFUE" connection. Another correlation students made was putting the sentence that discusses 97% efficiency with the one that says, " . . . when you can cut your heat loss to a

minimum of only 3%?" While correlating seemed to be quite an obvious strategy to me, not all the students made these correlations.

Another part of classification is recognizing the subject of the text. For example, statements like, "It's talking about different kinds of programs" or "Now we're talking about efficiency" signal that the reader is recognizing, and more importantly, is stating the subject of the text. It exemplifies that the student is trying to work with a hierarchy of ideas in the sentences. In this hierarchy, the top level is the subject. Grouping also comes into play in the consideration of a hierarchical view of the subject. The second level would consist of the major groups that the students find. The clues to grouping come in sentences such as, "It tells about the amount of heat lost or the temperature" and "I'll put little two's by these so I know." The last statement was made by Student N, who marked her test sheet 1A, 1B, 1C, 1D; 2A, 2B, 2C and so forth instead of the usual 1-2-3-4-5-6-7. Student N's technique is a graphic representation of her developmental strategy. She groups her ideas before she goes about determining their order. In fact, she does so in a classic textbook way. I found her strategy interesting because I discussed just this technique in the minilectures; however, Student N was not in the experimental group.

Noting comparisons is very closely related to grouping. Students have to think of the likenesses and

differences between ideas in order to determine groupings for them. The technique suggests a global kind of organizing that is not apparent in correlating. It also suggests an ability to think logically. For example, a student may understand the meanings of each sentence, but he may not be able to see how they are related. However, students who do see the relationships between ideas, and comparing is one way, are able to apply their thoughts to the task logically.

The next strategy is process of elimination. The students who used this technique seemed to be doing one of two things. They were using the technique as a way to encourage them almost at the start of the assignment, and they used the technique when they felt as if their primary strategy was failing them or when they needed to check what they had done. These two excerpts exemplify the difference between the two strategies. Student F makes all of these comments in the pretest: "That´s four out of ten I´ve got so far." ; "Just a matter of elimination. Get this thing straightened out." ; "I´ve got 1-2-3-4-5 of the 10 sentences." ; "1-2-3-4-5-6-7. Okay, now I´m down to seven of them. Okay, I´ve got 3 open. Let´s try again." Student F was obviously depending heavily on the process of elimination technique to organize. Student A, on the other hand, uses the process of elimination technique only in the pretest, and he uses it only to help him determine the few sentences he has left to order after he has

determined an arrangement for the rest of the sentences. In this case, he has three sentences left that do not fit in: "I´m trying to find a place for all those other ones. #2, 10, and 12 left." Student A decides that these sentences go together at the end of the whole group of sentences, which they do in the actual text. This example illustrates the way that Student A was using process of elimination, which is quite different from the way Student F was using it by relying on it throughout both pretest and posttest.

The technique of sequential organizing is the third development strategy. Sequential organizing is different from classification in that students who sequentially organize their sentences look for sentence 1, then 2, then 3, whereas students who organize by classifying look for subject groups first and then determine their order. I secretly harbored the hope that I might find students organizing either by groups or by sequence. Unfortunately, this was not the case. Students did not exclusively use either method. The statistics show that 9 out of 14 students used sequential organizing in the pretest, and the same number used sequential organizing in the posttest (Appendix S). Out of those 9, 8 students used sequential organizing in both tests, but 4 of the 8 also used classification.

The strategy of paragraphing seemed important as I was initially reading the protocols because not all the

students marked or mentioned paragraphs. I had assumed that all the students would put sentences in paragraph form because the instruction told them to do so. Only 8 out of the 14 students mentioned paragraphs in the pretest, and only 5 of the 14 mentioned paragraphs in the posttest (Appendix S). Mentioning paragraphs illustrated that a student was separating ideas or that he was somewhat trained to recognize paragraphing as a meaning unit in writing. Of the 4 members of the experimental group, 2 mentioned paragraphs in both tests. While the other two students did not mention paragraphing in both tests, they did mention it in the posttest. The statistic seems more important in comparing the experimental with the control group. Of the 10 members of the control group, only 1 student mentioned paragraphs in the posttest. Thus, the students in the experimental group were using paragraphs to organize the information, which was of course one of the many topics of the minilectures. It is difficult to account for the control group's failure to mention or use paragraphs in their posttests, considering that they had written a number of papers for their technical writing class during the interim between the pretest and the posttest. Certainly they had encountered paragraph usage in writing these papers; thus, one would expect their protocols to have some mention of paragraphs. I can only theorize, by looking at the lower scores and the shorter amount of time they used for the posttest, that the

students in the control were not as committed to the assignment as the experimental group.

Paraphrasing is the last technique of the students that I considered. A student was designated as one who paraphrased if he paraphrased a significant number of times, at least three times. I equated paraphrasing with the desire on the part of the student to let me know what he was thinking. The students who paraphrased were making a sincere effort to voice their thoughts. These excerpts from the protocols of Student E demonstrate paraphrasing: "Then tell about stuff in the air in the house." "After saying when you do, tell where it is." Here, Student E not very eloquently outlines his suggestions for the placement of the sentences. But the important point is that he actually verbalizes his thoughts. Most of us do think in such abstract terms as his "stuff" suggests. Another student, Student J, follows the same technique: "#9 says what, and #11 says where." Student J is also thinking in abstract terms, but he is further showing that he can capsulize the information he is sorting through. Very few of the students paraphrased the information, 5 out of 14 on both of the tests (Appendix S). I made the assumption that the paraphrasers also used classification because paraphrasing suggests an effort first to conceptualize and then to group information, in short to classify. And indeed every one of the 5 paraphrasers also classified. The reason that I considered paraphrasing separately from

classification is that, while the techniques are related logically, paraphrasing suggested a sincere effort to think aloud.

The last section of developmental strategies consists of those that were employed in the text of the pretest or posttest. I devised two rather broad categories for strategies of the text--purpose and arrangement. While I have separated strategies of the student from those of the text, both are, in the strictest sense, strategies employed by the student. If a student noticed, and commented on, the purpose or the arrangement of the text, he appeared to me to be verbally oriented and cognizant of global issues. He could, that is, comprehend the total picture of the text and his part in reorganizing it. Students who considered the purpose and arrangement of the text must have thought they had to know the purpose and predict the arrangement in order to perform the task. Only 3 out of 14 students mentioned purpose in both pretests and posttests, while only 4 out of 14 students and 3 out of 14 students mentioned arrangement in the pretest and posttest, respectively (Appendix T). Only 1 student mentioned the purpose and arrangement of the text in both texts. He notes, "It seemed that most of the sentences I saw seemed to branch off of #9." "So, it would work from generalities to specifics." "I'm sure Group 1 is like a promotion sheet or brochure that promotes the furnace and all that." This student, Student J, astutely describes the texts. In the

posttest, in dealing with the description of the Adult and Continuing Education program, which I chose for its lack of a standard order among paragraphs, Student J makes this comment: "It seems that you can match up the sentences in pairs that go together. Putting pairs into an order is the harder part."

Student J certainly has the ability to think logically, and while he was not part of the experimental group, he had the second best combined score, 38 out of 88. Interestingly, the student with the best score, Student B, who scored 30 out of 88 and was part of the experimental group, did not mention purpose or arrangement of the text. In fact, in the posttest, the only characteristics and strategies he revealed were sound of whole sentences, sequential organizing, and paragraphing. Comparing the two best students provides some fascinating insights. While Student B is categorized as a repeater, Student J did not read the sentences. They both at times rely on the sounds of sentences or whole groups to determine their order. While Student J wrote out his sentences in the pretest, Student B did not write his sentences at all. Student B expressed frustration and satisfaction in the pretest, Student J did not. Student J paused and explained his thoughts after organizing, Student B did not. And while Student J depended on classification, Student B did not. The implication one can draw from these comparisons is that

there is no one right way to go about organizing. Students will rely on whatever their instincts or training suggests.

ENDNOTES

[1]Charles R. Cooper and Lee Odell, "Considerations of Sound in the Composing Processes of Published Writers," Research in the Teaching of English, 10 (Fall, 1976), 103-115.

[2] Lewis Carroll, Through the Looking Glass (New York: Signet, 1960), p. 134. Peter Farb in Word Play: What Happens When People Talk (New York: Bantam, 1973) makes this suggestion on page 317.

[3] Heidi Swarts, Linda S. Flower and John R. Hayes, "Designing Protocol Studies of the Writing Process: An Introduction" in New Directions in Composition Research, ed. Richard Beach and Lillian S. Bridwell (New York: The Guilford Press, 1984, p. 58.

[4] Ann Matsuhashi, "Pausing and Planning: The Tempo of Written Discourse Production," Research in the Teaching of English, 15 (May, 1981), 113-134. Linda Flower and John R. Hayes, "The Pregnant Pause: An Inquiry Into the Nature of Planning," Research in the Teaching of English, 15 (October, 1981), 229-243.

CHAPTER V

CONCLUSION

The relatively new research technique of thinking-aloud protocols has opened up areas of study that were once thought unreachable. Researchers have been able to intrude upon a subject's quite personal process of thinking while performing a task. With the aid of audio or video tape recorders, researchers can study the process of writing, and, in my work, the process of organizing. While we are not yet able to interpret all of the verbal signals these thinking-aloud protocols provide, we at least now have research tool with which to probe and to speculate.

I have sought answers to the question of how students organize, specifically, what are the strategies they use and what is the nature of their thinking. My purpose was to study the ways that the technical writing students in my classes organize writing and to see if my focusing on organization with a minilecture format influenced the ways the students went about organizing or the ways they perform an organizational task. I sought to discover whatever I could about organizing to add to the knowledge we already have about organization and to draw implications for teaching organizational techniques to students.

The minilectures I gave tested my theory that specific attention to the subject of organization would result in better performance on an organizational task. The higher scores of the experimental group suggest that the minilectures worked. The experimental group had a group score of over 51% on their posttests, while the control group scored 40%. This figure is somewhat more important in considering the grade point averages of the experimental and control groups. The control group's high school and college grade point averages are around five-tenths of a point higher, which represents a fairly large difference. The improvement of the experimental group from pretest to posttest is even more significant. Their overall pretest score was just over 36%, which means that their improvement was around 15%. Certainly, the minilectures had an effect.

I attribute part of the success of the minilectures to my approach. Students learn by doing things that are related to life. James Moffett uses this theory in teaching composition by making the writing assignments grow out of class interaction.[1] The idea that students learn by memorizing and being tested on a specific list of items that the instructor considers important has never appealed to me as an English instructor. Memorizing comma rules or rhetorical methods never seemed to help my students write better. I was sure that having my experimental group memorize organizational methods employed by writers was not going to help them perform better on an organizational

task. I made the minilectures as applicable to life as I could by drawing parallels between the ways writers organize thoughts and the ways people organize their lives. The students were much more eager to discuss ways of organizing a fishing tackle box than they were to memorize methods of arrangement.

Not only did I make the minilectures applicable to the students' lives, but I also took a multifaceted approach. We discussed the classical textbook methods of arrangement and outlining. We did exercises suggested by textbooks of composition and technical writing. We played logic games. And we talked about own our organizing strategies. I knew that students had different talents and different ways of thinking. I wanted to promote these talents by not forcing them to learn one way to organize. My primary goal was to interest them in the subject of organization, not to indoctrinate them in the use of one particular mode. The performance on their protocols shows that they did adopt whatever strategies worked for them, whether they were classifying, sequentially organizing, or pausing. The result was the same: all the students in the experimental group raised their scores.

Another possible reason for their improvement cannot be so well documented; however, I see it as equally as important as the subjects of the lectures. The reason is that the class atmosphere was nothing short of excellent. In a class of 4 students, the chances for a more personal

approach are obvious. The students knew that they were the experimental group in my testing and that I had hopes for them to show improvement. I think they probably were more serious about their performance on the posttest than the control group members were. Furthermore, they were undoubtedly infected by my enthusiasm for the subject. It is difficult, as an instructor, to show enthusiasm for a subject that I have taught many times before. However, providing the enthusiasm or energy in a class not only is the responsibility of the instructor, but it also can be valuable part of the learning process. Students learn more about things they are interested in and excited about.

Yet another aspect of the class atmosphere that I am probably not directly responsible for is that these students developed a rapport with each other. They were truly interested in one another's work, which they demonstrated by reading one another's writing and providing suggestions for more research or for format. Two of the 4 students, for instance, learned to use the word processors and typed all of their technical writing assignments on the computers. These two developed a kinship that is only possible in an environment where people are together learning a new skill. And the same can be said of the whole group in learning about organization. We were all working toward a common goal, and perhaps that kinship ultimately helped the students learn more about organization.

The higher scores on the posttest for the experimental group were not the only benefit of the experiments. Using thinking-aloud protocols in the experiments provided me with valuable information on the students' organizational processes. The mountain of typed pages that were the protocols was ominous, but the information they provided was proportionately rich. While I categorized the behavioral characteristics of reading, sound, writing, and verbal signals of performance and of the developmental strategies of the student and of the text, I still have much to learn from studying these transcripts. Where I took a general approach in classifying the range of characteristics and strategies in the protocols, another researcher might choose one characteristic to explore specifically. Or, another might compare the students with the best performance with those with the worst performance. Yet another might separate the features of the protocols into those that suggest verbal orientation and those that suggest logical orientation, if in fact the two do not overlap. As one group of researchers states, "the information a protocol yields is only as good as the questions we ask." [2] Clearly, the possibilites for study are boundless.

ENDNOTES

[1] James Moffett, Teaching the Universe of Discourse, (Boston: Houghton Mifflin Company, 1968), p. 119.

[2] Heidi Swarts, Linda S. Flower, and John R. Hayes, "Designing Protocol Studies of the Writing Process: An Introduction," in New Directions in Composition Research, ed. Richard Beach and Lillian S. Bridwell (New York: The Guilford Press, 1984), p. 70.

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APPENDIXES

APPENDIX A

CONSENT FORM

I consent to act as a subject for research in technical writing. My participation will not affect my grade in the course, and in the resultant study, my anonymity will be maintained.

Signature_____

Date_____

I consent to have my ACT scores and grade point averages released for use in this study only with the understanding that my name will not be used in the study.

Signature_____

Date_____

APPENDIX B

TEST SHEET FOR PRETEST

GROUP 1

_____ 1. Conventional gas furnaces send 300 to 450 degrees of heat up the flue or chimney due to venting requirements.

_____ 2. Some heat loss is inevitable, but why continue to lose 45% when you can cut that heat loss to a minimum of only 3%?

_____ 3. The Lennox Pulse produces heat unlike any other furnace, squeezing more heat from your fuel than ever before possible.

_____ 4. That means as much as 45% of the heat is vented outdoors (and 45 cents of every heat dollar you spend is wasted).

_____ 5. That's because the Pulse extracts 200 to 350 degrees more heat from the same amount of gas.

_____ 6. Since all gas furnaces require venting of combustion gases, none can be totally 100% efficient.

_____ 7. But the Pulse furnace flue temperature is only around 100 degrees.

_____ 8. But the Pulse is up to 97% efficient, with only 3% heat loss due to combustion venting.

_____ 9. This kind of efficiency translates into big savings for you on the bottom line of your heating bill.

_____ 10. But if your present gas furnace is over 10 years old, it is probably in the range of 55% to 60% efficient.

GROUP 2

____ 1. Most competitive high efficiency gas furnaces (above 82 AFUE) use indoor air for combustion.

____ 2. The result has been an outstanding performance record.

____ 3. Since chlorine is a common element in most households due to degassing of chlorinated municipal water supplies, household bleaches and cleaning solvents, corrosion can appear in furnace vents, heat exchangers and other components in a relatively short period of time.

____ 4. For example, to avoid the indoor chlorine problem, the Pulse uses 100% outdoor air for combustion.

____ 5. All furnaces over 82 AFUE condense the water vapor found in natural gas and combustion air at least part of the time.

____ 6. That's because the Pulse was developed with reliability as a number one priority.

____ 7. This can pose a potentially serious problem.

____ 8. The Lennox Pulse furnace does not have this problem because it was designed to control condensation.

____ 9. Such corrosive condensate can be highly damaging to your heating system.

____ 10. As further protection, the Pulse utilizes a dedicated PVC vent and a stainless steel heat transfer surface that are both highly corrosion resistant.

____ 11. This condensate is mildly acidic, and when chlorine-laced indoor air is used for combustion, it compounds the corrosive effect of the condensate.

____ 12. In fact, some Pulse furnaces have been operating for five years with thousands more in operation for at least two years--all over the U.S. and Canada--without the first sign of corrosion in any of them.

APPENDIX C

PRETEST TEXT--GROUP 1

The Lennox Pulse produces heat unlike any other furnace, squeezing more heat from your fuel than ever before possible.

Conventional gas furnaces send 300 to 450 degrees of heat up the flue or chimney due to venting requirements. But the Pulse furnace flue temperature is only around 100 degrees. That's because the Pulse extracts 200 to 350 degrees more heat from the same amount of gas. This kind of efficiency translates into big savings for you on the bottom line of your heating bill.

Since all gas furnaces require venting of combustion gases, none can be totally 100% efficient. But if your present gas furnace is over 10 years old, it is probably in the range of 55% to 60% efficient. That means as much as 45% of the heat is vented outdoors (and 45 cents of every heat dollar you spend is wasted.)

But the Pulse is up to 97% efficient, with only 3% heat loss due to combustion venting. Some heat loss is inevitable, but why continue to lose 45% when you can cut that heat loss to a minimum of only 3%?

APPENDIX D

PRETEST TEXT--GROUP 2

Most competitive high efficiency gas furnaces (above 82 AFUE) use indoor air for combustion. This can pose a potentially serious problem. All furnaces over 82 AFUE condense the water vapor found in natural gas and combustion air at least part of the time. This condensate is mildly acidic, and when chlorine-laced indoor air is used for combustion, it compounds the corrosive effect of the condensate. Such corrosive condensate can be highly damaging to your heating system. Since chlorine is a common element in most households due to degassing of chlorinated municipal water supplies, household bleaches and cleaning solvents, corrosion can appear in furnace vents, heat exchangers and other components in a relatively short period of time.

The Lennox Pulse furnace does not have this problem because it was designed to control condensation. For example, to avoid the indoor chlorine problem, the Pulse uses 100% outdoor air for combustion. As further protection, the Pulse utilizes a dedicated PVC vent and a stainless steel heat transfer surface that are both highly corrosion resistant. The result has been an outstanding performance record. In fact, some Pulse furnaces have been operating for five years with thousands more in operation for at least two years--all over the U.S. and Canada--without the first sign of corrosion in any of them. That's because the Pulse was developed with <u>reliability</u> as a number one priority.

APPENDIX E

TEST SHEET FOR POSTTEST

Group 1

____ 1. General continuing education involves activities for individual self-improvement and includes such subjects as foreign languages, communication skills, living skills and physical fitness.

____ 2. Many programs are in cooperation with other organizations, chambers of commerce, businesses, clubs and similar groups.

____ 3. The flexibility and responsiveness in the program allows for immediate attention to identified community needs.

____ 4. Program content includes instruction in the vocational areas of health, trade and industry, business and office, distributive, agriculture, home economics, technical and management.

____ 5. The faculty of the continuing education program includes teachers from Marshalltown Community College, Ellsworth Community College and the public schools, as well as many community persons who possess special skills and knowledge, communication skills and the desire to share with others.

____ 6. These are job-related for training, retraining and upgrading persons in their occupational areas.

____ 7. The adult high school completion program provides opportunity for adult non-high school graduates to prepare for the G.E.D. examination or to earn high school credit toward the high school diploma.

____ 8. Resources of the community are directed toward serving community needs in a meaningful, pragmatic way.

____ 9. The Adult and Continuing Education program of the Iowa Valley Community College District provides a variety of learning opportunities through its extensive program of credit-free courses, seminars, workshops and other community education and community service activities.

____ 10. Instruction is available for persons at all levels of educational attainment, grades 1 through 12.

____ 11. The program is carried out on a district-wide basis through cooperative arrangements with all 21 public school districts.

____ 12. Advisory committees help identify individual and community needs and determine program offerings.

____ 13. Courses, workshops and seminars are offered during the daytime, evenings and weekends in locations convenient to participants throughout the four-county Central Iowa area.

Group 2

____ 1. In addition to the LRC collection of more than 34,000 volumes and 300 periodicals, interlibrary loan services are available from several universities and from the public library.

____ 2. The staff includes experienced professional librarians, a media specialist, library assistants and students.

____ 3. The LRC, or library, Room 303, houses an extensive collection of audiovisual material as well as print material.

____ 4. The collection is designed to support and strengthen curricular offerings and to stimulate the individual work of students in many areas of interest.

____ 5. Photocopying services and equipment for using audiovisual material are available.

____ 6. Individual carrels, tables and conference rooms offer a variety of study areas for students.

____ 7. A professional staff member is on duty whenever the LRC is open to assist users in locating and using the resources.

____ 8. A growing library of books, periodicals, pamphlets, tapes, drama and poetry affords an opportunity for students to have access to needed resources.

____ 9. Also, the LRC has a collection of college and university catalogs on microfiche.

APPENDIX F

POSTTEST TEXT--GROUP 1

The Adult and Continuing Education program of the Iowa Valley Community College District provides a variety of learning opportunities through its extensive program of credit-free courses, seminars, workshops and other community education and community service activities.

The program is carried out on a district-wide basis through cooperative arrangements with all 21 public school districts. Many programs are in cooperation with other organizations, chambers of commerce, businesses, clubs and similar groups. Advisory committees help identify individual and community needs and determine program offerings.

The faculty of the continuing education program includes teachers from Marshalltown Community College, Ellsworth Community College and the public schools, as well as many community persons who possess special skills and knowledge, communication skills and the desire to share with others. Resources of the community are directed towards serving community needs in a meaningful, pragmatic way.

Program content includes instruction in the vocational areas of health, trade and industry, business and office, distributive, agricultural, home economics, technical and management. These are job-related for training, retraining and upgrading persons in their occupational areas.

General continuing education involves activities for individual self-improvement and includes such subjects as foreign languages, communication skills, living skills and physical fitness.

The adult high school completion program provides opportunity for adult non-high school graduates to prepare for the G.E.D. examination or to earn high school credit toward the high school diploma. Instruction is available for persons at all levels of educational attainment, grades 1 through 12.

The flexibility and responsiveness in the program allows for immediate attention to identified community needs. Courses, workshops and seminars are offered during the daytime, evenings and weekends in locations convenient to participants throughout the four-county Central Iowa area.

APPENDIX G

POSTTEST TEXT--GROUP 2

The LRC, or library, Room 303, houses an extensive collection of audiovisual material as well as print material. A growing library of books, periodicals, pamphlets, tapes, drama and poetry affords an opportunity for students to have access to needed resources. The collection is designed to support and strengthen curricular offerings and to stimulate the individual work of students in many areas of interest.

In addition to the LRC collection of more than 34,000 volumes and 300 periodicals, interlibrary loan services are available from several universities and from the public library. Individual carrels, tables and conference rooms offer a variety of study areas for students. Photocopying services and equipment for using audiovisual material are available. Also, the LRC has a collection of college and university catalogs on microfiche.

The staff includes experienced professional librarians, a media specialist, library assistants and students. A professional staff member is on duty whenever the LRC is open to assist users in locating and using the resources.

APPENDIX H

INSTRUCTION SHEET FOR PRETEST AND POSTTEST

Organization Exercise

This exercise is designed to test your organizing skills by having you organize groups of randomly organized sentences into paragraphs. I am particularly interested in what you are thinking while you are performing the task. Therefore, I encourage you to verbalize all of your thoughts into the tape recorder throughout the task. I realize that it is impossible to say everything you are thinking, so just try to say as much as you can.

INSTRUCTIONS: Please read the instructions before beginning.

PROCEDURE: 45 MINUTE TIME LIMIT

1. Push "Record" button on tape recorder.

2. Begin with sentences marked "Group 1."

3. Organize the randomly ordered sentences in Group 1 only into one or more coherent paragraphs. Use the blank paper provided for notes.

4. Say everything out loud as you are thinking and organizing.

5. Indicate your choices by listing sentence numbers in order or by writing out the entire paragraphs. Be sure to indicate where new paragraphs begin.

6. Proceed to Group 2 following the same procedure as for Group 1.

7. Turn off the tape recorder when you have completed the exercise.

8. Put your name on all of your written material and on your tape.

NOTE: Please remember to think aloud into the tape recorder throughout the exercise.

APPENDIX I

DEMOGRAPHICS

	Student	Age	Sex	Years since High school or G.E.D.	Major
EXPERIMENTAL	A	19	M	1	Arts & Sciences
	B	38	M	20	Drafting
	C	36	M	17	Electronics
	D	22	M	5	Drafting
CONTROL	E	19	M	1	Electronics
	F	43	M	25	Arts & Sciences
	G	20	M	2	Electronics
	H	19	M	1	Electronics
	I	24	M	6	Drafting
	J	19	M	1	Drafting
	K	19	M	1	Electronics
	L	19	M	1	Electronics
	M	20	M	2	Electronics
	N	19	F	1	Arts & Sciences

APPENDIX J

COLLEGE STATISTICS

	Student	G.P.A.	A.C.T. Scores English & Composite	College English Courses
EXPERIMENTAL	A	2.2		English I and II
	B	2.2		
	C	3.8		
	D	.6		
CONTROL	E	2.6		
	F	2.0		English I
	G	3.9	18/22	
	H	3.3	17/22	
	I	2.6		English I
	J	2.8		
	K	2.3		
	L	2.0	16/19	
	M	2.8		
	N	3.6		

APPENDIX K

HIGH SCHOOL STATISTICS

	Student	G.P.A.	English courses and grades		
			10th grade	11th grade	12th grade
EXPERIMENTAL	A	2.6	Comp: C	Comp: C	Comp: C
	B				
	C	1.8	Comp: D	Comp: D	
	D				
CONTROL	E	2.2	Comp:D+	Comp: D-	Comp: C
	F				
	G	3.7	Comp: B	Lit: A	
	H	2.6	Comp: C	Comp: C	
	I	2.3	Comp: C	Comp: C	
	J	3.1	Comp: A	Comp: B	Comp: A
	K	2.7	Comp: B		
	L	2.1	Comp: C	Comp: C	Comp: C
	M	2.7	Comp: C		Comp: C
	N				

APPENDIX L

PRETEST SCORES

	Student	By number off *			By percent **		
		Group 1	Group 2	Total	Group 1	Group 2	Total
EXPERIMENTAL	A	12	12	24	45.5	45.5	45.5
	B	18	2	20	18.2	90.9	54.6
	C	14	22	36	36.4	0.0	18.2
	D	12	20	32	45.5	9.1	27.3
CONTROL	E	14	16	30	36.4	27.3	31.8
	F	16	16	32	27.3	27.3	27.3
	G	6	12	18	72.7	45.5	59.1
	H	18	4	22	18.2	81.8	50.0
	I	18	20	38	18.2	9.1	13.6
	J	14	6	20	36.4	72.7	54.6
	K	18	4	22	18.2	81.8	50.0
	L	12	14	26	45.5	36.4	40.9
	M	6	16	22	72.7	27.3	50.0
	N	8	18	26	63.6	18.2	40.9

* 0 is the value of a perfect score. 22 is the value of the maximum number off for each group. Thus the total maximum number off is 44.

** 100% is the value of a perfect score.

APPENDIX M

POSTTEST SCORES

	Student	By number off *			By percent **		
		Group 1	Group 2	Total	Group 1	Group 2	Total
EXPERIMENTAL	A	6	14	20	72.7	36.4	54.6
	B	4	6	10	81.8	72.7	77.3
	C	16	18	34	27.3	18.2	22.7
	D	16	6	22	27.3	72.7	50.0
CONTROL	E	12	10	22	45.5	54.6	50.0
	F	14	14	28	36.4	36.4	36.4
	G	6	16	22	72.7	27.3	50.0
	H	20	16	36	9.1	27.3	18.2
	I	16	0	16	27.3	100.0	63.6
	J	8	10	18	63.6	54.6	59.1
	K	14	18	32	36.4	18.2	27.3
	L	18	14	32	18.2	36.4	27.3
	M	14	16	30	36.4	27.3	31.8
	N	18	10	28	18.2	54.6	36.4

* 0 is the value of a perfect score. 22 is the value of the maximum number off for each group. Thus the total maximum number off is 44.

** 100% is the value of a perfect score.

APPENDIX N

RECORDING TIMES IN MINUTES

	Students	Pretest	Posttest	Difference*
EXPERIMENTAL	A	35	30	-5
	B	28	18	-10
	C	45	45	0
	D	12	6	-6
CONTROL	E	28	12	-16
	F	22	10	-12
	G	45	25	-20
	H	35	17	-18
	I	42	21	-21
	J	45	28	-17
	K	31	18	-13
	L	17	14	-3
	M	11	12	+1
	N	25	20	-5

* The minus sign (-) indicates less time spent on the posttest. The plus sign (+) indicates more time spent on the posttest.

APPENDIX O

BEHAVIORAL CHARACTERISTICS--METHOD OF READING SENTENCES *

	Student	Pretest	Posttest
EXPERIMENTAL	A	R	R
	B	R	R
	C	S	S
	D	D	D
CONTROL	E	W	W
	F	R	R
	G	R	S
	H	W	S
	I	S	S
	J	D	D
	K	R	R
	L	S	S
	M	S	S
	N	R	R

* W=whole group S=skips sentences
R=repeats D=does not read sentences

APPENDIX P

BEHAVIORAL CHARACTERISTICS--

CONSIDERATIONS OF SOUND

	Student	Topic & Concluding Sentences		Whole groups	
		Pretest	Posttest	Pretest	Posttest
EXPERIMENTAL	A	X	X	X	X
	B			X	X
	C	X			
	D		X		
CONTROL	E	X			
	F	X	X	X	X
	G				
	H	X		X	
	I	X	X	X	X
	J		X		X
	K	X	X		X
	L	X			X
	M				
	N	X		X	X

APPENDIX Q

BEHAVIORAL CHARACTERISTICS--

WRITING OUT SENTENCES*

Student	Pretest	Posttest
A		
B		
C	X	X
D		
E		
F		
G		
H		
I	X	
J	X	
K	X	
L		
M		
N		

* An "X" indicates that student wrote out sentences during the test.

APPENDIX R

BEHAVIORAL CHARACTERISTICS--VERBAL SIGNALS OF PERFORMANCE

	Student	FRUSTRATION		SATISFACTION		META-COMMENTS		PAUSES	
		Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
EXPERIMENTAL	A	X		X	X		X		
	B	X		X					
	C	X	X			X	X		X
	D	X			X			X	
CONTROL	E	X		X	X				
	F	X			X	X			
	G							X	X
	H								
	I	X	X						
	J							X	
	K			X					X
	L	X	X					X	
	M	X	X	X		X	X	X	X
	N	X	X	X		X			

APPENDIX S

DEVELOPMENTAL STRATEGIES--

OF THE STUDENT

	Student	CLASSIFICATION		PROCESS OF ELIMINATION		SEQUENTIAL ORGANIZING		PARAGRAPHING		PARAPHRASING	
		Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
EXPERIMENTAL	A	X		X			X	X	X		
	B					X	X		X		
	C	X	X	X					X		
	D	X	X			X	X	X	X	X	X
CONTROL	E	X				X	X			X	X
	F	X	X	X	X	X	X	X			X
	G	X	X			X	X	X		X	X
	H	X	X			X					
	I	X		X	X			X	X		
	J	X	X							X	X
	K					X	X				
	L			X		X	X	X		X	
	M					X	X	X			
	N	X	X	X	X			X			

APPENDIX T

DEVELOPMENTAL STRATEGIES--

OF THE TEXT

		PURPOSE		ARRANGEMENT	
	Student	Pretest	Posttest	Pretest	Posttest
EXPERIMENTAL	A				X
	B				
	C	X	X		
	D			X	
CONTROL	E		X	X	X
	F	X			
	G				
	H				
	I			X	
	J	X	X	X	X
	K				
	L				
	M				
	N				

VITA

Pamela Moffatt Colbert

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