The Cognition of Discovery: Defining a Rhetorical Problem

Linda Flower and John R. Hayes

Metaphors give shape to mysteries, and traditionally we have used the metaphor of *discovery* to describe the writer's creative process. Its broad meaning has sheltered many intellectual styles ranging from classical invention to modern heuristics such as tagmemics to self-exploratory modes such as Pre-Writing. Furthermore, *discovery* carries an implicit suggestion that, somewhere in the mind's recesses or in data outside the mind, there is something waiting to be discovered, and that writing is a way to bring that something out. However, if we try to use this metaphor to teach or analyze the creative process itself, we discover its limitations.[1]

First of all, because *discovery* emphasizes the rather glamorous experience of "Eureka, now I see it," it obscures the fact that writers don't *find* meanings, they *make* them. A writer in the act of discovery is hard at work searching memory, forming concepts, and forging a new structure of ideas, while at the same time trying to juggle all the constraints imposed by his or her purpose, audience, and language itself.[2] Discovery, the event, and its product, new insights, are only the end result of a complicated intellectual process. And it is this process we need to understand more fully.

There is a second, practical reason for teachers to probe this metaphor. The notion of discovery is surrounded by a mythology which, like the popular myth of romantic inspiration, can lead writers to self-defeating writing strategies. The myth of discovery implies a method, and this method is based on the premise that hidden stores of insight and ready-made ideas exist, buried in the mind of the writer, waiting only to be "discovered." Or they are to be found in books and data if only the enterprising researcher knows where to look. What does one do when a ready-made answer can't be found in external sources? The myth says, "look to your own experience." But what happens when a writer on this internal voyage of discovery still can't "find" something to say because his or her "ideas" as such are not actually formed? What is there to "discover" if only confused experience and conflicting per-

Linda Flower is director of the Business and Professional Communications Program at Carnegie-Mellon University. John R. Hayes, also at Carnegie-Mellon, is a cognitive psychologist and has recently completed a book on creative processes, *Cognitive Psychology: Thinking and Creating.*

ceptions are stored in a writer's memory? The mythology of discovery doesn't warn the writer that he or she must often build or create new concepts out of the raw material of experience; nor does it tell the writer how to do it. And yet, this act of *creating* ideas, not finding them, is at the heart of significant writing.

When an attempt at this literal discovery fails, as it often must, it leads inexperienced writers to an unnecessary defeat. Fluent writers are affected by the myth of discovery in another way. As Nancy Sommers has shown, many seem to equate the successful discovery of something to say (i.e., the "flow" of stored ideas) with successful writing, whether that flow is appropriate to the rhetorical situation or not.[3] The myth of discovery, as many of us see it in students, leads the poor writer to give up too soon and the fluent writer to be satisfied with too little.

Discovery, then, is a perplexing notion. On the one hand, it metaphorically describes an intellectual process we want to teach. On the other hand, the metaphor and mythology of discovery itself often distort our vision of that process. This paper attempts to probe the cognition of discovery, the process itself, by studying the way writers initiate and guide themselves through the act of making meaning.

Our approach has been to study writing as a problem-solving, cognitive process. From a psychological point of view, people have a "problem" whenever they are at some point "A" and wish to be at another point "B"; for example, when they have a new insight into *Hamlet*, but have yet to write the paper that will explain it. Their problem-solving process is the thinking process they use to get to point "B," the completed paper. That process might involve many intellectual skills including open, exploratory procedures, such as free writing and day dreaming. But it is important to remember that this process is not a creative accident.

In this study we wanted to explore the problem-solving or discovery process that produces new insight and new ideas. So we started with what many feel to be the most crucial part of that process—the act of finding or defining the problem to be "solved." As Ann Berthoff says, "A shortcoming of most of our students [is] they do not easily recognize particular problems [that need to be solved] because they do not have a method for, that is, a means of formulating critical questions."[4]

This shortcoming turns out to be critical because people only solve the problem they give themselves to solve. The act of formulating questions is sometimes called "problem-finding," but it is more accurate to say that writers build or represent such a problem to themselves, rather than "find" it. A rhetorical problem in particular is never merely a given: it is an elaborate construction which the writer creates in the act of composing. We wanted to see how writers actually go about building this inner, private representation.

There are a number of reasons why this act of constructing an image of one's rhetorical problem is worth study. First, it helps explain why writing, like other creative thinking, can be so utterly unpredictable. Even though a

teacher gives 20 students the same assignment, *the writers themselves create the problem they solve*. The reader is not the writer's only "fiction." Furthermore, the act of problem-finding is a critical part of general creativity in both the arts and sciences. Because people only solve the problems they give themselves, the act of representing the problem has a dramatic impact on performance. James Britton saw this with bewildered or unmotivated children, with their strange notions of what the teacher wanted, as did Sondra Perl working with adult basic writers. People simply rewrite an assignment or a situation to make it commensurate with their own skills, habits, or fears.[5] Although writing texts generally ignore this part of the writing process,[6] our work suggests that it may be one of the most critical steps the average writer takes.

The first part of this paper, then, will describe our method for studying the cognitive process by which people represent the rhetorical problem. Then we will present a model of the rhetorical problem itself, that is, a description of the major elements writers could consider in building such an image. Finally, we will use this model of the possible as a basis for comparing what good and poor writers actually do.

Studying Cognitive Processes

The research question we posed for ourselves was this: if discovery is an act of making meaning, not finding it, in response to a *self-defined problem* or goal, how does this problem get defined? Specifically, we wanted to answer three questions:

1. What aspects of a rhetorical problem do people actively represent to themselves? For example, do writers actually spend much time analyzing their audience, and if so, how do they do it?

2. If writers do spend time developing a full representation of their problem, does it help them generate new ideas?

3. And finally, are there any significant differences in the way good and poor writers go about this task?

In order to describe the problem definition process itself, we collected thinking-aloud protocols from both expert and novice writers. A protocol is a detailed record of a subject's behavior. Our protocols include a transcript of a tape recording made by writers instructed to verbalize their thinking process as they write, as well as all written material the writer produced. A typical protocol from a one-hour session will include four to five pages of notes and writing and 15 pages of typed transcript. The novice writers were college students who had gone to the Communication Skills Center for general writing problems such as coherence and organization. The expert writers were teachers of writing and rhetoric who had received year-long NEH fellowships to study writing. Each writer was given the following problem: "write about your job for the readers of *Seventeen* magazine, 13-14 year-old girls," and was

asked to compose out loud into a tape recorder as he or she worked. They were told to verbalize everything that went through their minds, including stray thoughts and crazy ideas, but not to try to analyze their thought process, just to express it.

A Model of the Rhetorical Problem

From these protocols, we pulled together a composite picture or model of the rhetorical problem itself. This composite is shown in Figure 1, with examples drawn from our writers' protocols. It is based on what the group of writers did and shows the basic elements of a writing problem which a given writer *could* actively consider in the process of composing, *if* he or she chose to. For example, the writer in the following excerpt is actively creating an image of himself or his *persona*, an image of what effect he might have on his reader, and an initial representation of a meaning or idea he might choose to develop, as the words in brackets indicate.

> Ah, in fact, that might be a useful thing to focus on, how a professor differs from . . . how a teacher differs from a professor, [meaning], and I see myself as a teacher, [*persona*], that might help them, my audience, to reconsider their notion of what an English teacher does. [effect on audience]

Taken as a whole, the *rhetorical problem* breaks into two major units. The

| The Rhetorical Problem | |
Elements of the Problem	Examples
THE RHETORICAL SITUATION	
Exigency or Assignment	"Write for Seventeen magazine; this is impossible."
Audience	"Someone like myself, but adjusted for twenty years."
THE WRITER'S OWN GOALS involving the	
Reader	"I'll change their notion of English teachers . . ."
Persona or Self	"I'll look like an idiot if I say . . ."
Meaning	"So if I compare those two attitudes . . ."
Text	"First we'll want an introduction."

Figure 1. Elements of the rhetorical problem writers represent to themselves in composing

first is the rhetorical *situation*. This situation, which is the writer's given, includes the audience and assignment. The second unit is the set of *goals* the writer himself creates. The four dominant kinds of goals we observed involved affecting the *reader*, creating a *persona* or voice, building a *meaning*, and producing a formal *text*. As you see, these turned out to closely parallel the four terms of the communication triangle: reader, writer, world, word. This parallel between communication theory and our study is a happy one, since protocol analysis lets us describe what writers actually do as they write, not just what we, as theorists, think they should do. And, as we will see, one of the major differences between good and poor writers will be how many aspects of this total rhetorical problem they actually consider and how thoroughly they represent any aspect of it to themselves.

This model of the rhetorical problem reflects the elements writers actively consider as they write. It accounts for the conscious representation going on as writers compose. But is that enough? Protocols yield a wealth of information available in no other way, but they are limited to those aspects of the problem the writer is able in some way to articulate. But in understanding a writer's process we can't ignore that rich body of inarticulate information Polanyi would call our "tacit knowledge." We think that much of the information people have about rhetorical problems exists in the form of *stored problem representations*. Writers do no doubt have many such representations for familiar or conventional problems, such as writing a thank-you letter. Such a representation would contain not only a conventional definition of the situation, audience, and the writer's purpose, but might include quite detailed information about solutions, even down to appropriate tone and phrases. Experienced writers are likely to have stored representations of even quite complex rhetorical problems (e.g., writing a book review for readers of *The Daily Tribune*) if they have confronted them often before.

Naturally, if a writer has a stored representation that is fully adequate for the current situation, we wouldn't expect him to spend time building a new one. Achieving that kind of mental efficiency is what learning is all about. However, many writing problems, such as the one we gave our subjects, are unique and require a writer to build a *unique representation*. In such situations, we would expect a good writer to explore the problem afresh and to give conscious time and attention to building a unique representation. Therefore, in capturing the conscious representation of these unique problems, we feel we are likely to capture the critical part of the process. As it turned out, one of the most telling differences between our good and poor writers was the degree to which they created a unique, fully-developed representation of this unique rhetorical problem.

Our model or composite picture of the writer's rhetorical problem specifies two kinds of information writers represent to themselves: information about the rhetorical situation and information about the writer's own purpose and goals. We will discuss these two aspects of the rhetorical problem in order.

Representing a Rhetorical Situation

A *rhetorical situation* is the name we assign to the givens with which a writer must work, namely, the audience and assignment. Lloyd Bitzer's description of this situation as an exigency (e.g., assignment), an audience, and a set of constraints is a good description of what our subjects actually considered or represented to themselves.[7] (However, unlike Bitzer, we see this external situation as only part of a larger entity we call the rhetorical problem.)

The writer's initial analysis of the assignment and audience was usually brief. Most writers—both novice and expert—plunged quickly into generating ideas, but often returned to reconsider these givens later. For the novice writer, however, this re-examination of the *situation* often took the form of simply rereading the assignment, maybe two or three times, as if searching for a clue in it. A more intense form of this strategy was also observed by Perl, whose basic writers would read the assignment over and over until some key word struck an associative chord and reminded them of a topic on which they had something to say.[8] Although the novice writers in our study were actually analyzing the situation, they never moved beyond the sketchy, conventional representation of audience and assignment with which they started.

The good writers, by contrast, used their re-examination of the situation to add to their image of the audience or assignment. For example, this writer initially defined the audience as "someone like myself when I read—well, not like myself but adjusted for, well, twenty years later." Later in the protocol her image of the reader became significantly different:

> I feel a certain constraint knowing as I do the rather saccharine editorial policy. Perhaps I'm mistaken, but the last time I had my hair cut or something, I read it and they still seemed to be mostly looking at women as consumers of fashion and as consumers of men and really not as capable or interested in or likely to be drawn to an occupation like mine which is rather low paying and unglamorous and, ah, far from chic clothes.

As you can see, this writer is creating a sophisticated, complex image of a reader—half alter-ego, half fashion consumer—which she will have to deal with in the act of writing. No doubt it will be harder to write for such an audience than for a simple stereotype, but the final result is going to be more effective if she has indeed represented her audience accurately. We can imagine similar differences in two students' representations of an assignment such as "analyze *Hamlet*." Let us assume that both writers have roughly equal bodies of knowledge stored in memory. One writer might draw on that knowledge to give herself detailed instructions, e.g., "'analyze this play'; that means I should try to break it down into some kind of parts. Perhaps I could analyze the plot, or the issues in the play, or its theatrical conventions." This student is drawing on the experience and semantic knowledge which both students possess to create a highly developed image of how to analyze something (e.g., break it into parts) and how to analyze this play in particular (e.g.,

find the critical issues). Meanwhile, another writer might blithely represent the problem as "Write another theme and talk about *Hamlet* this time, in time for Tuesday's class. That probably means about two pages."

Representing One's Purpose and Goals

An audience and exigency can jolt a writer into action, but the force which drives composing is the writer's own set of goals, purposes, or intentions. A major part of defining the rhetorical problem then is representing one's own goals. As we might predict from the way writers progressively fill in their image of the audience, writers also build a progressive representation of their goals as they write.

We can break these goals into four groups. The first is focused on the effect the writer wants to have on the *reader*. These can range from quite ambitious global plans, such as "I'll change their image of English teachers," down to decisions about local effects, such as "make this sound plausible," or "make this seem immediate to their experience." At times the intention of the writer is to have a direct personal effect on the reader as a person. For example, one writer structured her paper in order to make her reader "remain in a state of suspension [about jobs] and remain in an attentive posture toward her own history, abilities, and sources of satisfaction." She wanted to make the reader "feel autonomous and optimistic and effective." At other times the goal is a more general one of making the reader simply see something or comprehend accurately a train of thought (e.g., "I've got to attract the attention of the reader," or "There needs to be a transition between those two ideas to be clear").

One of the hallmarks of the good writers was the time they spent thinking about how they wanted to affect a reader. They were clearly representing their rhetorical problem as a complex speech act. The poor writers, by contrast, often seemed tied to their topic. This difference matters because, in our study, one of the most powerful strategies we saw for producing new ideas throughout the composing process was planning what one wanted to do to or for one's reader.

A second kind of purpose writers represent to themselves involves the relationship they wish to establish with the reader. This relationship can also be described as the *persona*, projected self, or voice the writer wishes to create. This part of the problem representation is the least likely to appear in a protocol because writers are probably likely to draw on a stored representation of their *persona* even for unique problems. Furthermore, decisions about one's *persona* are often expressed by changes in word choice and tone, not by direct statements. Nevertheless, this is a part of a writer's goals or purpose which he or she must define in some way. In one writer this issue was directly broached three times. At the beginning of composing, she saw her role as that of a free-lance writer writing to a formula. But unfortunately

> my sense is that it's a formula which I'm not sure I know, so I suppose
> what I have to do is invent what the formula might be, and then try to
> include events or occurrences or attitude or experiences in my own job
> that could be conveyed in formula. So let's see. . . .

Clearly, her sense of her role as formula writer affects how she will go about
writing this paper. But later this same writer revised her relationship with the
reader and in so doing radically changed the rhetorical problem. She accused
herself of taking the hypocritical voice of adulthood and set a new goal:

> I feel enormously doubtful of my capacity to relate very effectively to the
> audience that is specified and in that case, I mean, all I can do is, is just,
> you know, present myself, present my concepts and my message or my
> utterance in a kind of simple and straightforward and unpretentious way,
> I hope.

A third goal writers develop involves the writer's attempt to build a coher-
ent network of ideas, to create *meaning*. All writers start, we assume, with a
stored goal that probably says something like, "Explore what you know about
this topic and write it down; that is, generate and express relevant ideas." We
see evidence of this goal when writers test or evaluate what they've just said
to see if it is related to or consistent with other ideas. Many of our writers
never appeared to develop goals much more sophisticated than this gen-
erate-and-express goal, which, in its most basic form, could produce simply
an interior monologue. However, some writers defined their meaning-
making problem in more complex and demanding ways, telling themselves to
focus on an important difference, to pursue an idea because it seemed chal-
lenging, or to step back and decide "more generally, how do I want to charac-
terize my job." Perhaps the difference here is one of degree. At one end of a
spectrum, writers are merely trying to express a network of ideas already
formed and available in memory; at the other, writers are consciously at-
tempting to probe for analogues and contradictions, to form new concepts,
and perhaps even to restructure their old knowledge of the subject.

Finally, a fourth goal which writers represent involves the formal or con-
ventional features of a written text. Early in composing, writers appear to
make many basic decisions about their genre and set up goals such as "write
an introduction first." Most college students no doubt have a great deal of
information in their stored representation of the problem "write a short es-
say." However, once into the text, writers often expand their image of pos-
sibilities by considering unique features the text might include. For example,
writers tell themselves to "fictionalize it," to "use a direct question," "try a
rhetorical question," or "try to add a little example or little story here to flesh
it out." In doing so, they set up goals based primarily on their knowledge of
the conventions of writing and the features of texts. This may be one way in
which extensive reading affects a person's ability to write: a well-read person
simply has a much larger and richer set of images of what a text can look like.
Goals such as these often have plans for reaching the goal built right into
them. For example, when one of the expert writers decided to use a

problem/solution format for the paper, he was immediately able to tap a pocket of stored plans for creating such a format. The convention itself specified just what to include. Furthermore, once he set up this familiar format as a goal, he saw what to do with a whole body of previously unorganized ideas.

Differences among Writers

This six-part model of the rhetorical problem attempts to describe the major kinds of givens and goals writers could represent to themselves as they compose. As a model for comparison it allowed us to see patterns in what our good and poor writers actually did. The differences, which were striking, were these:

1. Good writers respond to *all* aspects of the rhetorical problem. As they compose they build a unique representation not only of their audience and assignment, but also of their goals involving the audience, their own *persona*, and the text. By contrast, the problem representations of the poor writers were concerned primarily with the features and conventions of a written text, such as number of pages or magazine format. For example, Figure 2 shows a vivid contrast between an expert and novice when we compare the way two writers represented their rhetorical problem in the first 60 lines of a protocol. The numbers are based on categorizing phrases and sentences within the protocol.

| | Analysis of rhetorical situation: Audience and Assignment | Analysis of goals | | | | |
		Audience	Self	Text	Meaning	Total
Novice	7	0	0	3	7	17
Expert	18	11	1	3	9	42

Figure 2. Number of times writer explicitly represented each aspect of the rhetorical problem in first 60 lines of protocol

As you can see, the expert made reference to his audience or assignment 18 times in the first seven to eight minutes of composing, whereas the novice considered the rhetorical situation less than half that often. The most striking difference of course, is in their tendency to represent or create goals for dealing with the audience. Finally, the column marked "Total" shows our expert writer simply spending more time than the novice in thinking about and commenting on the rhetorical problem, as opposed to spending that time generating text.

2. In building their problem representation, good writers create a particularly rich network of goals for affecting their reader. Furthermore, these goals, based on affecting a reader, also helped the writer generate new ideas. In an earlier study we discovered that our experienced writers (a different group this time) generated up to 60 per cent of their new ideas in response to the larger rhetorical problem (that is, in response to the assignment, their audience, or their own goals). Only 30 per cent were in response to the topic alone. For example, a writer would say, "I'll want an introduction that pulls you in," instead of merely reciting facts about the topic, such as "As an engineer the first thing to do is . . ." In the poor writers the results were almost reversed: 70 per cent of their new ideas were statements about the topic alone without concern for the larger rhetorical problem.[9] All of this suggests that setting up goals to affect a reader is not only a reasonable act, but a powerful strategy for generating new ideas and exploring even a topic as personal as "my job."

As you might easily predict, plans for affecting a reader also give the final paper a more effective rhetorical focus. For example, one of the novice writers, whose only goals for affecting the audience were to "explain [his] job simply so it would appeal to a broad range of intellect," ended up writing a detailed technical analysis of steam turbulence in an electrical generator. The topic was of considerable importance to him as a future research engineer, but hardly well focused for the readers of *Seventeen*.

3. Good writers represent the problem not only in more breadth, but in depth. As they write, they continue to develop their image of the reader, the situation, and their own goals with increasing detail and specificity. We saw this in the writer who came back to revise and elaborate her image of her fashion-consuming reader. By contrast, poor writers often remain throughout the entire composing period with the flat, undeveloped, conventional representation of the problem with which they started.

The main conclusion of our study is this: good writers are simply solving a different problem than poor writers. Given the fluency we can expect from native speakers, this raises an important question. Would the performance of poor writers change if they too had a richer sense of what they were trying to do as they wrote, or if they had more of the goals for affecting the reader which were so stimulating to the good writers? People only solve the problems they represent to themselves. Our guess is that the poor writers we studied possess verbal and rhetorical skills which they fail to use because of their underdeveloped image of their rhetorical problem. Because they have narrowed a rhetorical act to a paper-writing problem, their representation of the problem doesn't call on abilities they may well have.

This study has, we think, two important implications, one for teaching and one for research. First, if we can describe how a person represents his or her own problem in the act of writing, we will be describing a part of what makes a writer "creative." A recent, long-range study of the development of creative

skill in fine art showed some striking parallels between successful artists and our expert writers. This seven-year study, entitled *The Creative Vision: A Longitudinal Study of Problem-Finding in Art*, concluded that the critical ability which distinguished the successful artists was not technical skill, but what the authors called *problem-finding*—the ability to envision, pose, formulate, or create a new problematic situation.[10] Furthermore, in this experimental study of artists at work, the three behaviors which distinguished the successful artists were the breadth and depth of their exploration of the problem and their delay in reaching closure on the finished product. In this experiment the artists were given a studio equipped with materials and a collection of objects they might draw. The successful artists, like our expert writers, explored more of the materials before them and explored them in more depth, fingering, moving, touching, rearranging, and playing with alternatives, versus moving quickly to a rather conventional arrangement and sketch. Once drawing was begun, the artists' willingness to explore and reformulate the problem continued, often until the drawing was nearly completed. Similarly, our successful writers continued to develop and alter their representation of the problem throughout the writing process. This important study of creativity in fine art suggested that problem-finding is a talent, a cognitive skill which can lead to creativity. The parallels between these two studies suggest that problem-finding in both literature and art is related not only to success, but in some less well defined way to "creativity" itself.

Other studies in the psychology of creativity make this link between creative thinking and problem-solving processes more explicit.[11] Many "creative" breakthroughs in science and the arts are not the result of finding a better technical solution to an old problem (e.g., the disease-producing influence of evil spirits), but of seeing a new problem (e.g., the existence of germs). In many cases, the solution procedure is relatively straightforward once one has defined the problem. For example, Virginia Woolf's *The Waves* or Van Gogh's impressionistic landscapes are less a technical feat than an act of imagining a new problem or set of goals for the artist.

We feel there are implications for exciting research in this area. This study has attempted to develop a model of the rhetorical problem as a guide to further research, and to describe three major differences between good and poor writers. But there is much we could learn about how people define their rhetorical problems as they write and why they make some of the choices they do.

The second implication we see in our own study is that the ability to explore a rhetorical problem is eminently teachable. Unlike a metaphoric "discovery," problem-finding is not a totally mysterious or magical act. Writers discover what they want to do by insistently, energetically exploring the entire problem before them and building for themselves a unique image of the problem they want to solve. A part of creative thinking is just plain thinking.

Exploring a topic alone isn't enough. As Donald Murray put it, "writers

wait for signals" which tell them it is time to write, which "give a sense of closure, a way of handling a diffuse and overwhelming subject."[12] Many of the "signals" Murray described, such as having found a point of view, a voice, or a genre, parallel our description of the goals and plans we saw good writers making. If we can teach students to explore and define their own problems, even within the constraints of an assignment, we can help them to create inspiration instead of wait for it.

Notes

1. This research was partially supported by a grant from the National Institute of Education, Department of Health, Education, and Welfare, Grant NIE G780195.

2. Linda Flower and John R. Hayes, "The Dynamics of Composing: Making Plans and Juggling Constraints," in *Cognitive Processes in Writing*, ed. Lee Gregg and Erwin Steinberg (Hillsdale, NJ: Lawrence Erlbaum, in press); Linda Flower and John R. Hayes, "Problem Solving Strategies and the Writing Process," *College English*, 39 (Dec. 1977), 449-461.

3. Nancy I. Sommers, "Revision Strategies of Student Writers and Experienced Writers," MLA Convention, New York, 28 Dec. 1978.

4. Ann E. Berthoff, "Towards a Pedagogy of Knowing," *Freshman English News*, 7 (Spring 1978), 4.

5. James Britton et al., *The Development of Writing Abilities (11-18)* (London: Macmillan, 1975); Sondra Perl, "Five Writers Writing: Case Studies of the Composing Process of Unskilled College Writers," Diss. New York University, 1978.

6. Richard L. Larson, "The Rhetorical Act of Planning a Piece of Discourse." Beaver College Conference on Evaluation of Writing, Glenside, PA, October 1978.

7. Lloyd Bitzer, "The Rhetorical Situation," *Philosophy and Rhetoric*, 1 (Jan. 1968), 1-14.

8. Perl, "Five Writers Writing."

9. Linda Flower and John R. Hayes, "Process-Based Evaluation of Writing: Changing the Performance, Not the Product," American Educational Research Association Convention, San Francisco, 9 April 1979.

10. Jacob W. Getzels and Mihaly Csikszentmihalyi, *The Creative Vision: A Longitudinal Study of Problem Finding in Art* (New York: John Wiley and Sons, 1976).

11. John R. Hayes, *Cognitive Psychology: Thinking and Creating* (Homewood, IL: Dorsey Press, 1978); M. Wertheimer, *Productive Thinking* (New York: Harper and Row, 1945).

12. Donald M. Murray, "Write Before Writing," *College Composition and Communication*, 29 (Dec. 1978), 375-381.