



Problem-Solving Strategies and the Writing Process

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Problem-Solving Strategies and the Writing Process

IN THE MIDST of the composition renaissance, an odd fact stands out: our basic methods of teaching writing are the same ones English academics were using in the seventeenth century.¹ We still undertake to teach people to write primarily by dissecting and describing a completed piece of writing. The student is (a) exposed to the formal descriptive categories of rhetoric (modes of argument—definition, cause and effect, etc.—and modes of discourse—description, persuasion, etc.), (b) offered good examples (usually professional ones) and bad examples (usually his/her own) and (c) encouraged to absorb the features of a socially approved style, with emphasis on grammar and usage. We help our students analyze the product, but we leave the process of writing up to inspiration.²

Within the classroom, “writing” appears to be a set of rules and models for the correct arrangement of preexistent ideas. In contrast, outside of school, in private life and professions, writing is a highly goal-oriented, intellectual performance. It is both a strategic action and a thinking problem. But because writing as an act of thinking is messy and mysterious compared to the concrete reality of the product, we tend to leave composing up to the vagaries of chance and god-given talent to relegate it to independent warm-up exercises designated as “pre-writing.” The inner, intellectual *process* of composing, the complex and

¹Wilbur Samuel Howell, *Logic and Rhetoric in England, 1500-1700* (Princeton: Princeton University Press, 1956), pp. 3-11, 64-145.

²We would however, qualify that rather general statement by noting at least three books which, although they do not focus on the process in quite the same way, are taking different roads into the same territory. The most influential book for us has been Richard Young, Alton Becker, and Kenneth Pike, *Rhetoric: Discovery and Change* (New York: Harcourt, Brace and World, 1970). As rewarding and intellectually significant for teachers as for students, it combines analytical, historical, and psychological approaches to writing. Peter Elbow's *Writing Without Teachers* (Oxford: Oxford Univ. Press, 1973) is a wonderfully teachable book which shares our interest in the experience of the writer, although we would take issue with him on some aspects of the process as he describes it. Finally, William Coles's *Composing: A Self-Creating Process* (Rochelle Park, N.J.: Hayden Book Co., 1974) represents a radically different teaching approach than the one here, but a shared body of assumptions about the importance of cognition and creative perception in writing.

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sometimes frustrating experience we all go through as we write, is a virtually unexplored territory.

This gap between the textbook and the experience is a problem composition must face. Because the act of writing is a complex cognitive skill, not a body of knowledge, teaching writers to analyze the product often fails to intervene at a meaningful stage in the writer's performance. Such teaching leaves a gap because it has little to say about the techniques and thinking process of writing as a student (or anyone else) experiences it.

I. WRITING AS A FORM OF PROBLEM SOLVING

In an effort to treat writing as a thinking problem, rather than an arrangement problem, this paper will offer an introduction to some of the underlying problem-solving processes writers use in the act of composing. The research and teaching experiment it is based on started as an attempt to understand the mental process of writing as it exists for "normal" writers, and then to apply that knowledge to helping people write. "Problem solving," as a relatively new area in cognitive psychology, is uniquely adapted for this plan because it combines a well-developed experimental method for studying thought processes with a teaching method Aristotle used—teaching the student heuristic procedures for thinking through problems. In studying writing as a problem-solving process we have attempted, first, to describe some of the basic heuristic procedures which underlying writing, and then to translate these heuristics into teachable techniques.

As the study of cognitive or thinking processes, problem solving explores the wide array of mental procedures people use to process information in order to achieve their goals.³ People use basic problem-solving procedures (such as planning, means/ends analysis, inference making) to solve all kinds of "problems," which range from inventing a mouse trap to designing a course syllabus or writing a sonnet. Articulating our own ideas and intentions to someone else—getting the right words on paper—draws on a staggering array of mental gymnastics, from simply generating language to highly sophisticated concept formation. However, the heuristic procedures which help us do this are often surprisingly simple. Such heuristics can often be brought to consciousness and improved by training.

A heuristic is an alternative to trial and error. It is simply the codification of a useful technique or cognitive skill. It can operate as a discovery procedure or a way of getting to a goal.⁴ Many fields have them; for example, the scientific

³The ground-breaking work in this field is Allen Newell and Herbert Simon's, *Human Problem Solving* (Englewood Cliffs: Prentice-Hall, Inc., 1972). For a more basic textbook introduction see Peter Lindsay and Donald Norman, *Human Information Processing: An Introduction to Psychology* (San Diego: Academic Press, 1972); or Wayne Wickelgren, *How to Solve Problems* (San Francisco: W. H. Freeman, 1974). Finally, for a direct application of problem solving to problems in creativity, see John R. Hayes, *Thinking and Creating: An Introduction to Cognitive Psychology* (Homewood, Ill.: Dorsey Press, forthcoming).

⁴Heuristics are, in fact a psychological necessity since most problems allow far more alternatives than we could ever evaluate. For example, in a chess game you have 10^{120} different

method is itself a heuristic, as is journalism's efficient Who? What? When? Where? Why? formula for collecting information. The important thing about heuristics is that they are not rules, which dictate a right or wrong way, but are alternative methods for doing something—methods which often formalize the efficient procedure a good scientist or journalist would use unconsciously. Because they make an intuitive method explicit, heuristics open complex processes up to the possibility of rational choice.

Strategies for Writing: Inspiration, Prescription, and Writer's Block

In the hope of opening the writing process up to increased self-awareness, we have studied the heuristics and strategies of both good and poor writers, using the methods of "protocol analysis." In order to tap the process itself, not the writer's later version of what he thought he did, protocol analysis uses the taped transcript (or experimental "protocol") of a writer asked to compose out loud. That is, he is asked to verbalize all thoughts that go through his mind, including false starts, stray thoughts, and repetitions.

The first striking fact that emerges from these protocols is that some writers have a very limited repertory of thinking techniques to call on as they write. They may find themselves trapped, for example, in the endless frustration of a "word search" when they really need to be generating an idea structure. This limited repertory is often linked to an inability to change tactics when the current procedure (e.g., trying to perfect a first sentence) has led to a block or dead end. Although the writer has alternative procedures, she/he may not have enough self-conscious awareness of his/her own skills to invoke them when needed.

Many inexperienced writers, whether they are students, businesspeople, or academics, feel they have only three major alternative strategies for writing: prescription (how the textbooks pretend people do it), inspiration (the infinitely mysterious way people really do it), and writer's block (a default behavior if neither of the above work). Our hope is to add a fourth alternative to this repertory: problem-solving techniques for thinking through the process.

Many writers depend heavily on inspiration because it produces their best, most efficient, and most satisfying writing. Many believe inspiration comes from the outside and must simply be waited upon; most have no effective recourse when it fails. Unfortunately, many writing problems are thinking problems which inspiration is ill-adapted to solve. Because inspiration is always dependent on the mental preparation that went before, it often does fail for the passively expectant writer waiting for the magic flow of ideas.

As an alternative to waiting out truant inspiration, a writer may resort to one of the prescriptive methods of writing taught in grade school, endorsed by his

paths to choose from, but less than 10^{16} microseconds in a century to explore them. So heuristics, or rules of thumb such as "try to control the center with your pawns," cut down the field of choices and offer the high probability of a good solution.

textbooks, and prized by those who want a sure-fire formula for required writing. The method is simple: name the topic, generate an outline of the obvious points ("cliches I know about the value of team sports or facts about thermal pollution"), and elaborate to fill in the blanks created by the outline. The result will probably bore the writer even though he may strongly feel it should pass muster: he followed the rules and, anyway, teachers are supposed to like that sort of thing. When inspiration breaks down, it's a grim picture for both the writer who has to grind something out and for the reader (teacher) who has to pretend it resembles serious thought.

A Problem-Solving Strategy for Writing

A problem-solving approach to writing offers an alternative strategy for confronting the thinking process. The remainder of this paper will present an overview of the heuristics we have learned from protocol analysis (the way good writers do it), from psychological studies of creativity, and from the traditions of rhetoric and composition teaching. We have used these heuristics to teach writing not only in composition courses, but as a condensed unit in problem-solving courses and management courses, and in workshops for teachers.

One advantage of these heuristics is that they give the writer a repertory of alternatives and the power of choice even as he is caught up in the struggle with words. Because these heuristics are a kind of shorthand for cognitive operations, they give the writer self-conscious access to some of the thinking techniques that normally constitute "inspiration." A second advantage of these heuristics is that they focus directly on the two major intellectual tasks the writer faces: the need (1) to generate ideas in language and then (2) to construct those ideas into a written structure adapted to the needs of a reader and the goals of the writer.

In formulating our strategy in this two-part way, we have made a fundamental assumption about the composing process: namely, that it can often be divided into two complementary but semi-autonomous processes, which we designate as generating versus constructing on one level and playing versus pushing on another. This division in our model reflects one of the essential dichotomies that pervades the literature on creativity and imagination. In their various ways, artists, critics, and psychologists have long recognized a distinction between what we might call inspiration and work; between romanticism's principle of organic unity and neoclassicism's equal veneration of conscious craft; between that nature-given "grace beyond the reach of art" and the man-made art of the commonplace "n'er so well expressed." Over time the prestige and precise definition of each mode varies, but together they represent two stable, complementary dimensions of the creative process. Although experienced writers fluidly switch from one mode of thinking to the other as they write, there are important practical and psychological reasons for writers to be conscious about this distinction and to recognize the multiple cognitive styles writing requires.

II. A HEURISTIC STRATEGY FOR ANALYTICAL WRITING

The following heuristics, developed primarily for analytical writers, draw in part on established methods (such as brainstorming and synectics); others are our attempt to embody, in a teachable technique, some of the underlying problem-solving strategies good writers use. This shorthand version of the Heuristic Strategy was written for students with a limited to non-existent background in writing, but an interest in treating it as a problem they could solve.

PART ONE: PLANNING

I. PLAN

1. *Set Up a Goal*

Planning toward a goal is one of the most powerful of all problem-solving techniques because it lets you factor large problems down to manageable size.⁵ When you write a paper, you are choosing among an immense number of possible things you could say, all of which could be potentially "correct." You can streamline this decision process by shifting from focusing on your topic (what you know) to focusing on your goal (what you want to do with what you know).

In practical terms this means that you start to write by trying to answer the blunt question readers always ask—"so what?" Why is this particular information being written down, why should anyone else read it, and what do you hope to accomplish by writing it? By contrast, some writers start by making elaborate outlines, filling in all the facts and thoughts they happen to have on the topic (say, the psychological effects of noise). But outlines, especially premature ones, are often dominated by the structure of the available information (what all could be said about noise); whereas a plan is governed by the writer (what *you* want or need to say to explain your idea, educate your readers, or perhaps even change his mind).

2. *Find Operators*

As you make your plans, keep in mind that some plans have what are called "operators"; that is, they have built-in directions which tell you how to go about reaching your goal. Compare these two plans, one with operators, one without: (1) I want to be rich and famous, vs. (2) I want to study probability, statistics, and problem solving so I can get rich quick at Las Vegas and become famous writing a bestseller on how I did it. For a writer a plan with operators might be, "I want to forcefully argue both sides of this controversy to show the reader that I have pinpointed the crucial issues, but also to pave the way for my own ideas."

Plans without operators are often highly abstract; for example, "I want to discuss team sports . . . impress my reader . . . get an A in this course. Such goals are so large, vague, and difficult that they are more likely to lead to writer's block than to purposeful thinking. An operator creates a manageable subgoal and gives you a place to start working.

PART TWO: GENERATING IDEAS IN WORDS

These techniques increase your creativity by helping you (1) to break set and get

⁵For a highly readable and important study on the nature of planning see George Miller, Eugene Galanter and Karl Pribram's *Plans and the Structure of Behavior* (New York: Holt Rinehart and Winston, 1960).

out of conventional patterns of thinking, (2) to foster those important elusive intuitions which might otherwise be censored or slip away, and (3) to discover among your own ideas important connections you may not have seen. However, the real problem you are working on here is not just getting ideas, but *verbalizing* them. Your goal is to get your thinking down in words, phrases, sentences—fragments of writing. Until you can express what's in your mind in words, it can be said you don't really know it yet. These techniques will help you follow out your ideas and turn them into language.

I. PLAY YOUR THOUGHTS

1. *Turn off the Editor and Brainstorm*

Once you have a sense of your goal and the problem before you, brainstorming is a good way to jump in. Brainstorming is a form of creative, *goal-directed play*. It has two rules: keep writing and don't try to censor or perfect as you go.

Start in the middle, at the end, or with any issue that's on your mind; start any place you want, but get started writing. Don't censor ideas—write them down. When you come up with an idea or expression that isn't quite "right," resist the temptation to throw it out and start again. Instead, write it down so you can tease out the good idea or intuition that was hidden inside it. If you don't see how it all fits together now, don't worry; just get your ideas in words. When you've exhausted a topic or feel you can't go much further right now, skip to another topic that is simmering in your mind.

Secondly, don't spend time polishing your prose or making it "flow." Because you are not trying to turn out a finished paper in one pass, you don't need to worry about following an outline or writing introductions and transitions. (In fact, isn't it unreasonable to try to write those *before* you've actually articulated the ideas you want to connect or introduce?)

Brainstorming is like "free writing" in that it encourages you to follow where intuition leads. But it has one important difference: free writing is a form of free association, stream of consciousness expression—one idea leads to another which leads to another, like links in a chain. Brainstorming, on the other hand, is goal-directed thinking. Although your thought is encouraged to go off on fresh and productive tangents, it is always returning, like spokes in a wheel, to focus on the problem at hand.

2. *Stage a Scenario*

People often come up with their best ideas and most powerful arguments when they are caught up in a live discussion. You can give yourself this same advantage by staging your own discussion. All of us have considerable powers of role playing which will let us take on not only certain familiar roles (such as the mature and responsible person we try to project at a job interview) but will also let us play the part of another person. That is, we can also switch parts, take on the attitudes and assumptions of the interviewer, and play that role when we want to.

You can use this ability to help generate better ideas in words by simulating the response of various readers or listeners: make them ask you questions (basic questions and difficult ones), raise objections, or make their own interpretations. For example, imagine what would be your reader's first response, and what would you say back to him? To get extra power out of this technique, give yourself different audiences with distinct expectations: a professor or supervisor listening critically to your logic, an employer looking to see what you can do, an audience of other experts at your lecture, or a friend trying to understand your main idea over a beer.

3. *Play Out An Analogy*

Whether we are conscious of it or not, much of our creative thinking is done by

using analogies. When we see a partial resemblance between two things (going through high school is like serving time), we acquire a whole new set of concepts to think with.

In using analogies, you have to both encourage and harness their tendency to overflowing, undirected productivity. Suppose, for example, you are analyzing the operation of a university. It occurs to you that universities have much in common with big businesses. The *potential* connections between the two are numerous: the analogy could suggest that both need professional management, or that both would benefit from healthy competition, or perhaps that both turn out a product but seem to spend most of their advertising budget marketing a self-image, etc. To tap this potential you could simply brainstorm all the possibilities your analogy will yield, though many will be spurious. Or you could take your intuition seriously and try to discover the hidden connection, implicit in your thinking, which initially suggested the analogy. By making the connection explicit, you can also decide if it is valid. You thought of big business in this context for a reason; why? what was the hook for you?

There are a number of other generating techniques which tap the power of analogic thinking.⁶ The most elaborate and formal one is synectics, in which you systematically explore four kinds of analogies: Personal, Symbolic, Direct, and Fantasy analogies. The most obvious technique is simply to apply the operator "like" to your idea: "Running a university is like . . ." If these two techniques seem a little formal or artificial you can take advantage of analogic thinking in a more common way: simply change your vocabulary.

One powerful way to broaden your idea base is to talk about your subject from a different perspective, using a different vocabulary. As a systems engineer you might analyze university life in terms of work flow and productivity. But if that perspective (and its language) only tells half the story, you could try the outlook and special language of a consumer: are a QPA and diploma devalued commodities offered at inflated prices? Or are they the real products a university offers? The goal is to change your idea set: the most natural way to do that is to change roles or vocabulary.

Why does this work? One reason is that by changing terms, you tap different pockets of knowledge. Playing out analogies in this way sorts through your stored knowledge for good ideas which aren't yet cross-indexed to each other in your memory. Changing your vocabulary, like changing roles in a scenario, lets you get to new, independent pockets of ideas and words.

4. *Rest and Incubate*

This can be an important part of the creative process if you do it well. When you need to stop work, do so only after you have formulated the next unsolved problem before you. Let your unfinished business simmer *actively* in the back of your mind and return to it from time to time. The corollary to using incubation well is that you are prepared, whenever a new idea or connection comes to you, to write it down. Don't expect inspiration to knock twice. The language you lose may be a loaded term that will only reveal its full possibilities later when you push it.

II. PUSH YOUR IDEAS

1. *Find a Cue Word or Rich Bit*

Your own private cue words, if you can mine them, are a source of original ideas.

⁶Two very useful books in this area are James L. Adams, *Conceptual Blockbusting: A Guide to Better Ideas* (San Francisco: W. H. Freeman and Co., 1974) and William Gordon's *Synecotics: The Development of Creative Capacity* (New York: Harper and Row, 1961).

Often in the process of brainstorming a writer will find that a single word, expression, or idea seems particularly important or that it keeps returning to her/his mind. For example, when people try to analyze their own writing process, many say that getting things to "flow" is a key concept for them, although they can't say exactly what that means. The expression "flow" is apparently functioning for them as a cue word, or what psycholinguists call a "rich bit": it stands as the center of a network of ideas and associations which are unique to the writer. By a kind of mental shorthand, that single expression brings together a whole body of ideas and experiences which are related in the person's thoughts.

When several writers were asked to push their ideas of "flow," one explained the experience as a process of hammering out rhythm and tight syntactic relations between sentences. For another writer, "flow" represented a radically different experience: getting things to flow meant following out a train of associations until he reached either a catharsis or a dead end. Both had much more fresh information about their intimidating assignment—to analyze the process of writing—than they had realized.

From a semantic perspective, code words are a familiar problem: I say cow, meaning Bossie, and you think Bessie. But from a writer's perspective they are a virtual gold mine—easily accessible sources of original ideas. For many students, especially basic writers who fear they don't have "original ideas," pushing their own code words can be a powerful, even liberating, experience.

We think in rich bits and codes because it's more efficient than processing all the particulars. However, the particulars a rich bit stands for may only be related in some vague or as yet undefined way. If you have not yet pushed those relationships into language, it would not be accurate to call them an idea. Rich bits are like any intuition; they need to be pushed and examined if they are going to yield solid ideas. This is the heart of the writer's job—pushing potential ideas into communicable ones; that is, into language.

2. *Nutshell Your Ideas and Teach Them*

Find a listener/fellow-student/long-suffering friend to whom you can condense and explain the essentials of your thinking. In two or three sentences—in a nutshell—lay out the whole substance of your paper. Nutshelling practically forces you to make the relationship between your major ideas explicit. (In doing so you generate an issue tree which will be more useful to you than an ordinary outline.) Nutshells put noisy supporting information in its place and help you focus on the essentials of what you have to say.

Teaching also helps focus ideas because it taps our intuitive strategies for dealing with an audience. Like nutshelling, it forces you to conceptualize your information and make sure your listener gets *the point*, not just the data. When a writer begins to feel agog with an accumulation of ideas and information, teaching in a nutshell can help generate the new concepts and categories that can put all those ideas in order.

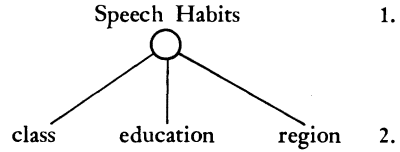
3. *Tree Your Ideas*

Most of the generation techniques described so far require you to think and write without the crutch or the straightjacket of a tidy outline. However, one of your major goals is to produce a paper with a clear and tight structure. Experienced writers resolve this apparent dilemma in the following way: they try to *pull* an outline *out* of the material they generate, rather than write to fill an outline in. Building an issue tree is a technique for structuring your ideas *after* you've begun to generate. It has two major advantages over starting with an outline: (1) It offers a more graphic representation of how ideas are related; (2) it shows you what you haven't yet said and where you need to do more thinking. A simple issue tree starts by trying to put the fragments of brainstorming into a hierarchical order:

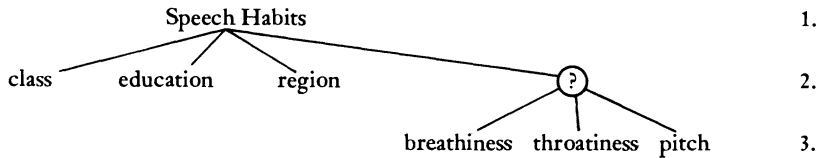
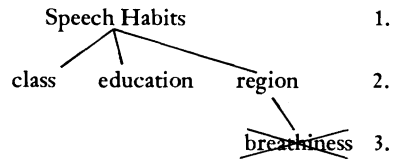
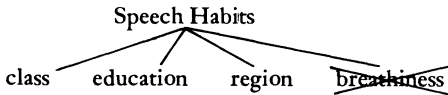
Fragments

- a. Speech habits have social aspects.
- b. Speech is related to class.
- c. Speech is affected by education.
- d. Speech is determined by regional background.
- x. Breathiness is considered a sexy trait in women.
- y. Throatiness is “unfeminine” in women, “mature” in men.
- z. A wide pitch range is heard as “effeminate” in men or women.

Tree

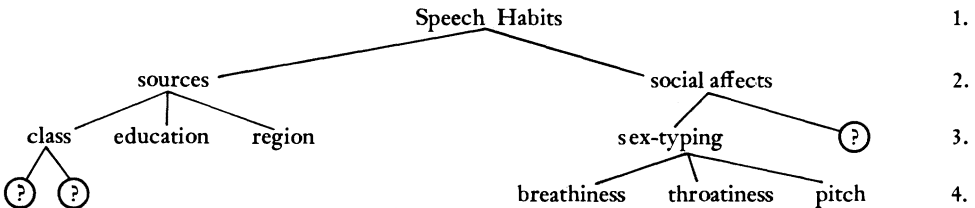


A preliminary tree shows two things: (1) fragments b, c, and d are at equal levels of abstraction and belong on the second level of the tree. They give the writer a focus for further idea generation. (2) Fragments x, y, and z, by contrast, are related to speech habits but they won't fit on level 2 along with b, c, d, nor will they fit under them as sub-categories. However, added together, x, y, and z could produce a fourth level-2 category.



Trying to build an issue tree shows the writer that his/her next problem is to generate a new concept—an idea which will tie these three fragments together. The chief advantage of an issue tree is precisely this: it is a working tool which helps the writer see the structure of his/her thought as it develops and see where s/he needs to do more thinking.

In this example the issue tree goes on working. Once the writer has generated a new concept, s/he can see that while b, c, d, and e, all “relate” to a, they do so in different ways. A more developed tree, such as the one below, might not only clarify the writer's thinking, but suggest areas in which to generate ideas.



An outline, by contrast, can encourage a writer to paint by numbers—to simply fill in the blanks. An early outline, unlike an issue tree with empty slots, assumes that a writer starts writing with a clear knowledge of his/her high level concepts. Writing is reduced to a process of filling in the details. The truth of the matter, unfortunately, is that a writer's normal task is a thinking task. S/he must transform information

into ideas and forge new, more adequate structures for those ideas than the ones s/he started out with.

4. *Test Your Writing Against Your Own Editor*

Try reading what you have written as if you were a first-time reader by going straight through your draft and locating any places that leave you somewhat confused. The sharpest analyst is the one who can pinpoint what he doesn't yet know or where he needs to go to work.

There are two techniques which will help you play the role of an objective reader who sees only what is written—not what you *meant* to say. The first is to read your prose carefully, word for word, as if you had never seen it before, and let its logic, syntax, and vocabulary lead you where they actually go. Read only what is on the page and cut out the well-inflected oral performance that goes on in your head when you *skim* over your own prose. If you let it, the inner voice will create emphasis, jump over the unclear bits, and fill in extra meanings from memory, while it lets you nod in agreement at familiar ideas and enjoy the pleasure of your own confirmed anticipations.

An even more powerful technique, if you can find a place to do it, is to read your own writing out loud. Don't whisper or you'll just be talking to yourself again. Read it in a good firm voice and listen to find out what you actually said. Better yet, create a scenario by positing your audience sitting there listening to you.

PART THREE: CONSTRUCTING FOR AN AUDIENCE

A first draft often satisfies a writer; it seems to say just what s/he meant. But when s/he comes back a day, a week, or a year later, many of the supporting assumptions and loaded meanings she brought to the first reading have vanished. The gaps, which s/he once filled in unconsciously, now stand out in the writing and demand explanation.

This week-after experience is often the plight of our readers. The goal of the constructing heuristics is to help you figure out ahead of time how to structure your private version of a paper so it fills the gaps and fits the needs of another mind, namely, your audience.

In essence, what these heuristics ask you to do is perform a means/ends analysis on your own writing. That is, they ask you to decide what *ends* you hope to achieve by writing and then to consider some of the specific *means* that might help you do it.

I. ENDS

What, exactly, are you trying to achieve in this paper or this paragraph, and what effect do you intend to have on your reader? Working from even a simple plan with operators lets you break out of the haphazard momentum writing sometimes imposes ("I'll just write a version and see how it turns out") and work as a goal-directed problem-solver. Good plans themselves are flexible and will probably keep changing as you go along. What separates a problem-solving writer from a simply intuitive writer is not the plan itself, but the fact that s/he is planning. You can use the four questions which follow to generate plans not only for an entire paper, when necessary, but for individual paragraphs and even sentences that are giving you trouble.

1. *Identify a Mutual End You and the Reader Share*

This is the "so what" question again, with the emphasis on your reader this time. What common goal do the two of you share? The desire to know your opinions on a subject is rarely enough to motivate most readers. Presuppose a reader with six papers on her/his desk and the time to read one. This statement, which you may even use later in your introduction, says why yours is the one s/he wants to read now.

2. *Decide on Your Own Specific Ends*

a. What do you want the reader to *know* at the end of your paper? What is the central information you want him/her to remember? When you know this, you can focus the rest of your writing around it.

b. What do you want your reader to *think about* that information? What *conclusions* would an ideal reader, one who really understood you, draw from your discussion? Generally speaking, this is the most difficult part of your paper to articulate, but the most important part for your reader. Assume you have a normal reader who will go away with two or three main ideas. What do *you* want those to be? If you can't explicitly state these summary concepts, the Nutshelling or Teaching heuristics are good techniques for forming such concepts.

c. What do you want your reader to *do*? Given what your reader will know and possibly think at the end of your paper, do you want him/her to apply it, and if so, how? Tell him/her.

II. ROADBLOCKS

Once you have planned what you want your writing to accomplish, consider possible roadblocks. Is your reader likely to have any expectations or assumptions, negative attitudes, or crucial gaps in knowledge that would block your Mutual Ends? If so, you will have to decide what you are going to do: confront them, detour, or ignore?

III. MEANS

1. *Develop a Rhetorical Strategy*

Developing a rhetorical strategy necessarily involves a wide range of skills and methods, from the sophisticated ones of Aristotle to simplistic formulas for packing three examples beneath every point. Rather than review some of these familiar methods we will focus here on a new heuristic based on the cognitive needs of the reader. The goal of this heuristic is to transform Writer-Based prose and its typical structures into Reader-Based prose. This rhetorical strategy is designed to help the reader comprehend more of what the writer has to say.

Writer-Based Prose. Writing is inevitably a somewhat egocentric enterprise. It is always easiest to talk to ourselves, and we naturally tend to express ideas in the same patterns in which we store them in our own mind. But if our goal is to communicate to someone else, those patterns in our own head may not be particularly clear or effective for a reader. The writer's job is to translate his/her own train of thought into a rhetorical structure. That is, s/he must translate his/her own egocentric or writer-based organization of information into a reader-based structure that meets the practical and cognitive needs of a reader.

Writer-Based prose is often the natural result of generating ideas; it borrows its structure from either the writer's own discovery process or from a structure inherent in the material the writer examined. For example, papers which start, "Shakespeare wrote three kinds of plays . . ." or "In the economy a business cycle is defined as . . ." often let the writer "print out" his stored knowledge about the subject instead of reshaping that information to a purpose. Writing which depends on a textbook or list structure often buries its point in a mass of related information. Because the writer failed to restructure information to support a conclusion, the job is left to the reader, who may be unwilling or unable to undertake the task.

A second, even more compelling, way to organize a paper is to simply follow the pattern of your own discovery process. ("In studying the stress patterns in this design, the first thing to consider is . . ." or "If income level, then, is a strong indicator of energy consumption, we can start to develop a predictive model which will . . .") This pattern has the virtue of any form of drama: it keeps interest by withholding closure, if, that is, the audience is willing to wait that long for the point. Unfortu-

nately, most academic and professional readers are impatient and tend to interpret such narrative, step-by-step structures as either wandering and confused (does he have a point?) or as a form of hedging.

Both of these examples of Writer-Based prose have advantages—for the writer. They are an easy and natural way to express one's thought. Furthermore, it is often most efficient to generate ideas in this form. The point is that in constructing a paper, a writer must recognize his/her own use of code words and writer-based structures and try to transform them to meet the needs of his/her reader.

Reader-Based Prose. There are many ways to write with a reader in mind. We will offer two heuristics well suited for analytical papers. The first is to set up a paper around the problem it is intended to solve and the conclusion you intend to argue for. Papers organized around problems not only focus a reader's attention, they help the writer subordinate his information to his goals and draw conclusions.

A second technique is to organize ideas in a clear hierarchy or tree. In composing, writers often work from the bottom of a tree up to more inclusive concepts. But readers understand best when they have an overview, when they can see an idea structure from the top down.⁷

2. *Test Your Rhetorical Strategy*

If you are lucky, you can test the effectiveness of your rhetorical structure on a live reader. Ask someone else to read your writing and to tell you in their own words what they thought you were saying. Use this feedback to compare what you intended with what you actually communicated.

If your friends seem to disappear when they see you coming, you can substitute a Highlight Test which simulates the comprehension process of a typical busy reader. With a highlighter in hand, go through your paper isolating the titles, headings, and topic sentences and conclusions to which position or convention give special significance. These major organizing elements should correspond to the top of your tree structure. They should form a capsule statement of the information you want your reader to focus on and retain. If they don't, you will be giving your reader loud but incorrect cues.

III. TEACHING AND USING HEURISTICS

The Process As a Whole

What does the entire process of writing look like? Do writers dutifully Plan, Generate, Construct, then turn out the light with the paper done? The answer is an emphatic *no*. Although we have grouped these heuristics together by their function, the process of writing rarely if ever exhibits those autonomous stages textbooks describe as Gather Information, Outline, and Write. Instead, thought in writing moves in a series of non-linear jumps from one problem and procedure to another.

We frequently talk of writing as if it were a series of independent temporally bounded actions (e.g., pre-writing, writing, rewriting). It is more accurate to see it as a hierarchical set of subproblems arranged under a goal or set of goals. The process then is an iterative one. For each subproblem along the way—whether it is making a logical connection between hazy ideas, or finding

⁷An extended analysis of writer-based prose and its transformation is available in Linda Flower, "Writer-Based Prose: A Cognitive Basis for Problems in Writing," in preparation.

a persuasive tone—the writer may draw on a whole repertoire of procedures and heuristic strategies. Having conscious access to some of those heuristics can make the process a lot easier.

Teaching

What are the implications of this unordered but dynamic process for teaching? We will emphasize three:

1. Heuristics do not offer a step-by-step formula for how to write. They are available, and powerful, but optional techniques for solving problems along the way. Although it makes sense, in general, to plan before you generate and to generate ideas before juggling them for a reader, these processes can often be collapsed together in a writer's thinking. Furthermore, as our subjects show, the entire process of plan, generate, and construct may be reiterated time and again at all levels of the process, from the act of articulating a key phrase to producing a sentence, paragraph, or entire paper. Problem solving asks the writer to trade in his/her set of rules for How to Write (Gather, Outline, and Write), which never worked too well anyway, for a set of Alternative Ways to Reach Your Goal When You Write.
2. A second basic fact about teaching heuristics is that people must experience a new thinking technique to learn it. Brainstorming, for example, is an acquired skill and may go against the grain for writers geared to producing usable prose on a first sitting. Students will not blithely relinquish their habitual composing techniques, no matter how inefficient, at the sight of a new idea. To make a new heuristic an *available* option it must be presented as a classroom experience which ensures that the writer actually learns how to use and apply a new technique. Even the inexperienced writer is never a tabula rasa; he comes equipped with many well-engrained, if counter-productive habits. It is one thing to teach students a new formula, another to actually change behavior. But writing, like problem-solving thinking in general, is a performance art. Unless we deal with writing as a form of thinking, we have simply taught the student the ropes of another classroom genre—the composition paper.
3. Finally, a problem-solving approach to writing works for many writers because it allows for the disorderly dynamics of serious thinking and encourages an analytical and experimental attitude in the writer. Heuristics ask the student to see writing as a communication problem they are setting out to solve with all the strategies they can muster. In practice, perhaps the most remarkable result of using heuristics is that early in the course students develop a conviction that writing is an important skill they can in fact master. Obviously, such a conviction is not always one hundred per cent warranted, but in replacing the mystique of talent and the fear of failing with the possibility of an attainable goal, problem solving helps writers draw more fully on the abilities they do have.