

6 Learning from Writing: An Initial Approach

In our discussion so far, we have assumed a typical English teacher stance and have taken it for granted that writing can and should play an important role in instruction in various academic subject areas. The changes that this role implies are far reaching, however. No matter how much we may believe in the power of writing to foster learning, the case for such widespread change needs to be made very carefully.

To make that case, the next three chapters briefly review previous research as well as present our own findings. As will become clear, the previous work is far from conclusive, while our own studies highlight the complexities as well as the benefits of the role of writing in learning.

In recent years there has been an increased focus on the teaching of writing in subject classrooms; "writing to learn" and teaching "writing across the curriculum" have become favored slogans in the 1980s (see Langer, 1984a, 1986b). Yet this focus has been based more on practical wisdom than on research evidence. In fact, at the present time there is little research to support the assumption that writing will bring about a generalized benefit to learning; the previous work is far from conclusive. While common sense, personal experience, and educational lore all suggest that writing is an activity that can lead to extensive rethinking, revising, and reformulating of what one knows, few studies have been undertaken to learn *when* people learn from writing, *what* kinds of learning result from engagement in different writing experiences, or *how* writing can be used to help students understand and remember the material they read.

Studies of Learning from Writing

The best evidence about the effects of writing on learning would come from studies that examine it directly. Does writing about a new topic help writers understand the new material? Unfortunately, no research tradition has addressed this question. The closest we can come is to look at the long series of studies on the effects of adjunct questioning and similar activities, which have usually come from research in

reading comprehension or study skills (for comprehensive reviews, see Applebee, 1984; Anderson and Biddle, 1975; Hamilton, 1985; Reder, 1980). Although examining only the simplest forms of writing activities, such studies (for example, Rothkopf, 1966, 1972) provide useful information about the effects of manipulating ideas (from text or memory) in the process of learning new material. The general conclusion that emerges from these studies is that any manipulation or elaboration of material being studied tends to improve later recall, but the type of improvement is very closely tied to the type of manipulation.

Studies of learning from text have examined several ways of responding to study activities requiring written responses that vary in length and format. Summarizing across studies, Anderson and Biddle (1975) found that studies requiring short-answer responses produced greater gains (in comparison with read-only control groups) than did studies requiring only multiple choice responses. Similarly, studies that have compared written with mental responses have generally found that the written responses led to better post-test performance (for example, Michael and Maccoby, 1961).

One way of interpreting these findings on response modes is related to the amount of elaboration or manipulation they require from the reader. Written responses require more active participation than non-written responses, and short-answer questions require more than multiple-choice items. Such an interpretation is consistent with the results of other studies that have looked directly at the effects of varying degrees of manipulation, elaboration, or "levels of processing" (Craig and Lockhart, 1972) on comprehension or recall (Barnett, Di Vesta, and Rogozinski, 1981; Di Vesta, Schultz, and Dangel, 1973; Frase, 1970, 1972; Schallert, 1976; Schwartz, 1980; Watts and Anderson, 1971). These studies assume that the more intermediate steps required to answer a question, the greater the depth of processing involved. In general, studies in this tradition have found that activities requiring greater depth of processing have stronger effects on comprehension and recall, although these effects may be attenuated if the task leads to selective focusing of attention on some parts of a passage to the exclusion of others.

A few studies have looked at the effects of note-taking, which requires more extensive writing than the other forms of study activities that have been examined. Early studies suggested that note-taking was more effective than read-only or listen-only conditions, though results were dependent on the strategies adopted and on whether the notes were available for later review (Di Vesta and Gray, 1972; Fisher and Harris, 1973; Schultz and Di Vesta, 1972).

In a later study, Bretzing and Kulhavy (1979) used four levels of note-taking to examine a depth-of-processing hypothesis. Their results suggest that note-taking is better than no note-taking and that the nature of the note-taking activity, not simply the additional time, is the critical feature. Bretzing and Kulhavy (1981) replicated this finding and found further that particular idea units were more likely to be recalled if they had been included rather than omitted in an individual's notes.

Glover et al. (1981) compared recall scores after five study tasks that varied in the extent of interaction with readers' previous knowledge. In general, they found the strongest effects for tasks that required readers to draw more extensively on their previous knowledge; paraphrase tasks led to better recall of passage information, while tasks that required the reader to make logical extensions led to higher rates of consistent intrusions. Glover et al. interpret such intrusions as evidence of the forming of "new" knowledge through the interaction of text information with what the readers already knew.

A few studies have examined more directly the effects of writing on learning. Newell (1984) examined the effects of note-taking, short-answer study questions, and analytic essay writing on passage recall, organization of passage-relevant knowledge, and ability to apply concepts in a new context. Using Langer's (1984b, 1984c) measure of organization of passage-relevant knowledge, he found significant differences favoring essay writing but not on the other measures. Essay writers also took more time to complete the study task, leaving it unclear whether the effects that he found were due to the nature of the task itself or were simply an artifact of taking more time to complete it.

Attempting to bridge the usual gap between process and product studies, Newell also used an adaptation of Flower's and Hayes's (1980b) think-aloud procedures to examine what the students were doing in the various tasks. He argued that differing patterns in think-aloud protocols may reveal the underlying causes of the differing patterns of learning in the experimental conditions. Newell's data show very different patterns in composing processes in the three conditions, raising the possibility of eventually being able to relate specific features of a writer's behavior, such as the amount of planning or questioning, to specific types of learning effects.

Scardamalia and Bereiter (1985) have also examined the relationship between writing and thinking about a particular topic. They posit that when writing contributes to thought, it does so because of a dialectic set up between two problem spaces, one defined by the rhetorical

problems of presenting a text, the other defined by the writer's topic knowledge and understanding. The data they report indicate that various kinds of procedural facilitation can be designed to enhance the underlying dialectic, leading to measurable changes in either the writing process or the writing product. These changes are inferred to reflect a more effective dialectic process, and in turn to reflect more thinking about the topic. These studies, however, provide evidence that the writing process has changed, but not that writers emerge with a better understanding of the topics they were writing about.

This brief overview of previous work suggests that we have yet to develop an adequate research base for the argument that writing activities can make a significant contribution to learning in general or to the development of higher level reasoning skills. Few studies have directly addressed these questions, and the related literature suggests that, to the extent that writing is related to learning, the relationships will be complex rather than straightforward.

Concerns such as these led us to focus directly on the ways that different kinds of writing-after-reading activities make a difference in students' thinking about and learning of their course material. In the following section, we report our first step in examining this issue, using a small sample of students and tasks; in chapters 7 and 8, we extend the approach to a larger sample and more complex comparisons.

The Initial Study

Early in the project's first year, we asked six high school juniors to participate in a study of the ways they approached writing about text and the effects that writing might have on learning what they read. All were living in an upper middle-class suburban community in the San Francisco Bay area and were average to above average students. The findings of this first, small study illustrate some of the broader issues with which we were concerned. We examined how the students approached three common study tasks: completing short-answer study questions, taking notes, and writing essays. These activities were chosen because we found them to be used most frequently by the science and social studies teachers participating in the first year of classroom studies. Two of these tasks, note-taking and study questions, were used by the collaborating teachers primarily to review and consolidate new material. The third task, writing an analytic essay, was used to help students reformulate and extend their knowledge.

To provide common material for the students to read and study, two social studies passages (766 and 1,721 words in length) were

chosen from an eleventh-grade American history textbook. One passage was about economic expansion after the Civil War, and the other was about the Great Depression. (See Appendix 2 for synopses of all reading passages and their characteristics.) Both came from high school social studies textbooks but were about topics the students had not yet studied. In particular, we were interested in examining how the students' engagement in the different writing activities affected their learning of the subject matter presented in the passages. We wanted to study both the reasoning processes they used when they engaged in each activity and the changes in their topic knowledge that might be apparent afterward.

Each student met with us individually for two sessions a week apart. At each session, the student read one passage and was then asked to study the information presented by either completing study questions, taking notes, or writing an essay:

1. Note-taking: The students were told to read and take notes as they usually do in studying for school.
2. Study questions: The twenty-five study questions were typical of those found in social studies textbooks and worksheets and required the students to fill in the correct response or to write a brief response of two or three sentences to a particular question.
3. Essay writing: The essay prompted analytic writing: for example, "Given what you learned from the passage, what do you feel were the two or three most important reasons for industrial growth in the late nineteenth and twentieth centuries? Explain the reasons for your choices."

Tasks and order were counterbalanced across students so that four students completed each task.

What They Wrote

The writing produced in response to these three tasks was, as expected, very different. The study questions led to the least amount of writing, though the total text that resulted, including the question stems provided by the study questions, was considerably longer. For example:

What were the major manufacturing industries in the United States at the turn of the century?

meat packing iron & steel lumber clothing textiles

What did profits on goods, bank loans, and foreign investments have in common?

all had to do with the growth because of money, capital

Although the students' notes involved somewhat more text, it was very fragmentary:

1. 1920's — prosperity, high wages, large profits, sustained dividends, increasing sales, invest (stock market)
2. not fortunate — Indians, Spanish speakers, blacks whose skills weren't needed

And the essays produced more extended, cohesive writing:

In the United States, between the late 19th century and early 20th century, industrial growth rose to above the highest level of any (other) nation . and this made the United States the premier manufacturing nation in the world. A large influx. *imp. Technology and continuous government aid, and backing, gr helped to create the nation industrial growth, which in turn boosted the United States' gross national product.

Great steps in technology were made in the period between. . . .

The responses to the tasks looked different, but were the thinking and learning also different? If so, how?

Thinking and Learning

So that we could examine the ideas and information the students focused on while engaged in the three study tasks, they were trained to think aloud as they completed each task, verbalizing all the thoughts that came into their heads (Flower and Hayes, 1980a, 1980b; Langer, 1986b, 1986c).

The students also completed a topic-specific knowledge measure before each read-and-study activity and again three days after the activity. The measure involved free association related to five concepts central to the meaning of each passage ("Jot down everything you think of when you see each word or phrase"). The responses were scored for extent of topic-specific knowledge, using a system developed by Langer (1980, 1981, 1982, 1984b, 1984c). The scores provided an index of learning (measured by change in topic-specific knowledge) in response to the three tasks. (See chapter 7 for a fuller discussion of this measure and how it is scored.)

The students' think-aloud protocols and the measures of passage-specific knowledge provide some interesting insights into the kinds of learning and thinking prompted by each of the three study tasks.

The Kinds of Thinking Each Task Fostered

Like the writing that resulted, the think-aloud protocols for the three tasks looked very different.

Study questions. In answering the study questions, the students tended to (1) read the question, (2) restate the question, (3) occasionally scan their memory of the passage, (4) refer to the passage for answers, and (5) write the answer they had arrived at. In general, they did not review the question, nor did they revise their answers at a later time. Thus, throughout each of the twenty-five questions in the activity, the students' major attention was on restating the questions and locating specific information in the passage. When the protocol comments were segmented into communication units (each expressing a new thought or idea, as in the examples below), more than 85 percent of the communication units represented time when the students were searching the text, as opposed to writing or thinking about their ideas. The students paid little attention to what they thought they knew or had learned.

These patterns are evident in the following transcript excerpts:

(1) What were the major manufacturing industries in the United States at the turn of the century?/ (2) Uhm, looking down the page./ (3) factors of growth./ (4) No, it's under/ (5) I'm reading over/ (6) I don't see any/. . . (11) they're looking for specific factors/ (12) uhhhh, ok, I found it at the bottom of the page/ (13) In 1900, for example, the main manufacturing industries were meat packing. . .

Note-taking. Of all three tasks, note-taking focused most attention on the content of the passage. A third of the protocol comments occurred when the students were reading the text; the rest occurred when they were writing what they had found in the text or thinking about the specific content to include in their notes. However, they did think about the specific ideas in the passage as they considered what was being said and whether to include it in their notes. They spent little time considering how the ideas related to each other or to other things they knew. While engaged in the note-taking activity, the students tended to read the passage in small segments and to use the temporal structure of the passage to structure their notes. They did not stop to integrate the information into larger units that might have then been used to structure their notes. Instead, they tended to use the text's paragraphs as their organizational frame. These patterns are evident in the following transcript excerpts:

(19) ok, so we're into part 2, a new section/ (20) uh, and this is talking about the not so fortunate people in the 20s/ (21) and uh, I'm going through to find the key words/ (22) and, ok, *not fortunate* to begin with/ (23) and then it lists some groups that

weren't fortunate/ *Indians*, Spanish speaking Americans/ (24) I'll just say Spanish speakers. . . .

Essay writing. When engaged in essay writing, the students tended to (1) read the text, (2) consider what they had read in terms of the question they were to answer, (3) brainstorm for relevant ideas, and (4) combine and recombine ideas as they constructed their own interpretation and response. Thus during essay writing the students gave more attention to generating, integrating, and evaluating the ideas they were considering; less than 10 percent of their comments occurred when referring back to the text. A typical excerpt from an essay protocol looked like this:

(98) So, I've got my opening paragraph right now/ (99) but I've got nothing to back it up, or anything like that/ (100) so I've got to go back and see what I've written/ (101) I want people to believe what I've said/ (102) So, I'm talking about, and the main question is what I personally feel were the most important reasons for industrial growth/ (103) and I've already said they were the technology and government aid, and backing/ (104) but I haven't said why/ (105) So, my second paragraph should probably start. . . .

Reasoning Operations

To more closely examine the differing approaches the students were taking, we categorized each comment in the protocols according to the type of thinking or reasoning it reflected. The seven categories that were analyzed were drawn from a comprehensive system developed to permit examination of on-line thinking during reading and writing tasks (see Langer, 1986b). These categories, described in detail in Appendix 1, are summarized below:

Questioning. Uncertainties and incomplete ideas that the person has at any point in developing the piece — related to the genre, content, or text (no specified guess or expectation).

"What were the major manufacturing industries in the United States at the turn of the century?"

Hypothesizing. Plans that the person makes about what will be presented, based on the desired function of a particular piece of text.

"Maybe it's factors of growth."

Using schemata. The ideas being developed or explained, based on the genre, content, or text.

"Not fortunate, to begin with."

Evaluating schemata. Evaluations and judgments made about the ideas.

Table 8

Communication Units in Think-Aloud Protocols

	Study Questions	Note-taking	Essay Writing
No. of communication units	523	556	1,033
Percent writing	52.4	82.0	76.8
Percent reading	47.6	18.0	23.2
No. of protocols	4	4	4

"That's not right."

Making metacomments. Comments about the person's use or nonuse of particular content or textual information.

"I found it at the bottom of the page."

Citing evidence. The information the writer presents, the explanations the writer provides, or the evidence the writer develops to answer a question or carry out a hypothesis.

". . . cause it's shorter."

Validating. Information, implied or direct, that the plan was fulfilled or a decision made.

"That's what it was. Well, that's what they're like."

Each communication unit was identified as falling into one of the reasoning categories; we also noted whether that comment occurred when the student was reading (referring back to the text) or writing and thinking about new ideas.

First, let us look at the number of ideas the students reported, as reflected in the total number of communication units in each think-aloud. Almost twice as many ideas were thought about and reported for the essays as for the note-taking or study-question activities (see table 8). The students' comments focused proportionately more on writing for the essays and on reading for the study questions. In completing the study questions, the students were forced back to the text to locate their answers. Even so, the writing that these tasks required led to more comments about writing than about reading or rereading the text.

Specific Reasoning Activities Prompted by the Study Tasks

As the specific types of reasoning activities are looked at more closely, clear differences emerge from one task to another; the relevant data

Table 9

Reasoning Operations during Three Types of Writing Activities

	Percentage of Communication Units		
	Study Questions	Note-taking	Essay Writing
Questioning	24.3	0.2	7.5
Hypothesizing	9.0	11.6	19.9
Using schemata	47.2	66.2	44.3
Schemata evaluated	4.8	5.2	6.2
Making metacomments	11.6	9.0	12.2
Evidence and validation	2.1	6.6	7.5
Total	100.0	100.0	100.0
No. of communication units	523	556	1,033

are summarized across students in table 9. *Questioning* (a relatively open-ended search for an answer) took place more frequently in the study-question activity than in any of the others, reflecting the students' shifting focus as they moved from one question to the next on the worksheet. *Hypothesizing* (requiring a firm prediction about the topic under study) occurred most frequently in essay writing, when the students were thinking about what to write and whether it made sense. *Using schemata* (comments about the content itself) occurred in the greatest proportion during note-taking, when the specific ideas were either taken directly from the text or were restated in the student's own words. *Evaluating schemata* (showing evidence of active evaluation of information or ideas), *making metacomments* (when the students commented directly on their attempts to get at meaning), *citing evidence*, and *validating* previous interpretations all occurred most frequently when the students were writing essays.

Overall, the greatest variety of reasoning operations occurred during essay writing, suggesting that this type of activity provided time for students to think most flexibly as they developed their ideas. The smallest range of reasoning operations occurred during the study-question activity. Although the students did focus on passage content, their attention was generally limited to restatements either of the questions themselves or of the particular content unit that answered each question. Somewhat more variety in reasoning operations occurred during note-taking, but this too was text based, with only limited attention to the global sense of the passage.

Learning

If there were a difference in the kinds of thinking and reasoning that each activity invoked, we would also expect to find differences in the knowledge the students gained from engaging in the three activities. The analysis of topic knowledge was designed to help us look for these differences. Topic knowledge was measured before each read-and-study activity and again three days later. The measure used looks at both the amount of knowledge each student had about the key concepts in the passage and at the extent of organization the student had imposed upon what he or she knew.

For these students, topic knowledge increased most for essay writing, next for note-taking, and least for the study questions. The biggest difference, however, was between essay writing and the other two activities. (If we rank the twelve sets of gain scores so that 1 represents the most gain and 12 the least, the average rank was 5.1 for essay writing, 6.8 for note-taking, and 7.6 for study questions.) This finding suggests that the extended writing activity presented the students with the opportunity not only to think about the items of information in the passages they had read, but also to integrate the information into the more highly organized units of knowledge that were reflected in the topic-knowledge measure.

Discussion

Even from these initial explorations, it is apparent that different study activities involved students in very different patterns of thinking and also led to different kinds of learning: (1) When completing the short-answer study questions, the students focused on specific ideas that the textbook writer had chosen. They thought about these ideas in an item-by-item fashion, with no integration of content across questions. (2) When taking notes, the students focused on larger concepts than when they completed short-answer study questions; they integrated ideas across sentence boundaries. However, while this led to concern with larger chunks of meaning, the ideas were treated relatively superficially. The students listed the information in a linear fashion in much the same way that it was presented in the text and did not reorganize it in their own ways. (3) When writing essays, the students seemed to step back from the text after reading — they reconceptualized the content in ways that cut across the specific information presented, focusing on larger issues or topics. In doing so, they integrated information and engaged in more complex thought. Of all

three activities, when writing essays the students seemed least bound by the immediate content, focusing instead on manipulating and reorganizing the new material. When doing the study questions, on the other hand, the students seemed to focus on many more individual content units but in a more cursory manner.

The results from this first study of student learning reinforced our initial expectations about the relationships between writing and learning and led us to undertake two larger scale studies examining the effects of various kinds of writing activities on learning. Results of these studies are presented in chapters 7 and 8.