Does text structure/summarization instruction facilitate learning from expository text?

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FIFTH-GRADE STUDENTS were instructed in a particular text structure to see whether it would improve their ability to learn from similarly structured social studies material. Eighty-two fifth-grade students were assigned either to a structure training group, which received direct instruction in recognizing and summarizing a conventional text structure (problem/solution), or to a traditional training group, which read and discussed answers to questions about social studies passages. As measured by responses to a main-idea essay question and by written summaries of two passages, students' ability to abstract the macrostructure of problem/solution text read independently was improved by the structure training.

Est-ce qu'enseigner à résumer/structurer un texte facilite l'apprentissage à partir de l'exposé?

UNE CERTAINE structure de texte a été enseignée à des élèves de cinquième année afin de savoir si cela pouvait améliorer leur apprentissage du matériel de sciences humaines présentant une structure semblable. On a soumis 82 élèves de cinquième année à l'un de ces groupes: soit un groupe d'enseignement de la structure, bénéficiant de l'enseignement direct d'une structure de texte conventionnelle (problème/solution), soit un groupe d'enseignement traditionnel dans lequel on lisait puis discutait des réponses aux questions posées sur des passages de sciences humaines. Tel qu'évalué par les réponses à une question à développement portant sur l'idée principale et par les résumés écrits de deux passages, la capacité des élèves pour résumer la macrostructure d'un texte à problème/solution lu de façon indépendante était augmentée chez ceux ayant bénéficié de l'enseignement de la structure.

¿La instrucción para estructuración/resumen de texto facilita el aprendizaje de texto exposito? 

SE INSTRUYO a estudiantes de quinto grado en una estructura de texto particular para ver si ésta ayudaba a mejorar su habilidad de aprender de materiales de ciencias sociales estructurados de forma similar. Se asignó a 82 estudiantes de quinto grado a un grupo de entrenamiento de estructura que recibió instrucción directa en una estructura de texto convencional (problema/solución) o a un grupo de entrenamiento tradicional que discutió respuestas a preguntas sobre pasajes de ciencias sociales. De acuerdo a las respuestas medidas por un ensayo de preguntas de la idea principal y por resúmenes escritos de dos pasajes, la habilidad de los estudiantes de abstraer la macroestructura de texto de problema/solución leído independientemente mejoró con el entrenamiento de estructura.
Can Textstruktur/Zusammenfassungslehre das Erlernen von erläuternden Texten erleichtern?


Most learning from reading, both in and out of school, depends on the ability to read and understand expository text. Although the empirical evidence is weak, experts contend that children generally have more difficulty reading expository than narrative text (Spiro & Taylor, 1980). Many factors may contribute to children's difficulty with expository text, including insufficient prior knowledge, lack of interest, and lack of motivation. As suggested by recent research in learning from reading, another contributing factor may be that children lack sensitivity to text structure—to the way the ideas in text are organized. Our focus in this study was to explore the effect of text structure instruction on middle-grade children's ability to learn from reading expository text.

Many current theories of reading comprehension assume, at least implicitly, that skilled readers automatically abstract a higher-order structure of text (Meyer, 1975; Rumelhart & Ortony, 1977; van Dijk & Kintsch, 1983). This macrostructure (van Dijk & Kintsch, 1983) represents the gist of a text organized into a coherent whole. The macrostructure guides encoding, recall, and reproduction of the essential points of the text. Formation of macrostructures is thus a prerequisite for success in tasks involving global comprehension and meaningful learning.

Middle-grade children apparently have difficulty forming macrostructures for expository text. For example, several researchers have shown that children in the middle grades have difficulty producing written summaries of expository text (Brown & Day, 1983; Taylor, 1986; Winograd, 1984). These children may have difficulty forming macrostructures because they have trouble identifying important information or finding the main idea in expository text. Indeed, in the Winograd (1984) and Taylor (1986) studies, ability to identify important information was significantly related to ability to summarize text.

Other research on learning from expository text has demonstrated that sensitivity to the organization of ideas in text—and hence to the relative importance of information—is related to comprehension and memory. For example, in several recent studies, researchers have examined the effect of readers' awareness of the author's text structure on their ability to recall expository text (McGee, 1982; Meyer, Brandt, & Bluth, 1980; Taylor, 1980, 1985). In these studies, awareness of the author's text structure was indexed by the readers' use of the author's structure in organizing their own recall protocols. In the study by Meyer, Brandt, and Bluth (1980), skilled ninth-grade readers tended to use the author's top-level structure in organizing their free recalls of expository texts, whereas readers with low comprehension skills did not. Furthermore, readers who employed the strategy of using the text's top-level structure recalled more information than those who did not.

Taylor (1980) found the same effect for younger readers. Sixth-grade good readers recalled more from short expository passages after two days than sixth-grade poor readers or fourth-grade good readers. This differential recall appeared to be related to the sixth-grade good readers' greater use of text structure: More sixth-grade good readers organized their de-
layed recalls according to the higher-order text structure than did sixth-grade poor readers or fourth-grade good readers. Also, both good and poor readers who organized their recalls according to the author's higher-order text structure recalled more than readers who did not.

Similarly, McGee (1982) found that fifth-grade good readers used the author's text structure more and recalled more total and superordinate idea units than fifth-grade poor readers or third-grade good readers. Finally, Taylor (1985) examined the ability of sixth-grade and college students to summarize passages from a social studies textbook. Compared to college students, sixth-grade students had difficulty understanding important ideas and/or including these ideas in either oral or written summaries. One may conclude from the Meyer et al. (1980), Taylor (1980, 1985), and McGee (1982) studies that age and reading ability are highly correlated with recall of expository material, perhaps because of skilled readers' greater awareness and use of the author's higher-order text structure.

Other evidence for the importance of awareness and use of text structure in macrostructure formation comes from studies demonstrating that instruction about text structure can improve comprehension and recall. One approach to fostering awareness of text structure is to teach readers to make some concrete representation of the organization of ideas in exposition. For example, in strategies such as “networking” (Dansereau et al., 1979) and mapping (Armbuster & Anderson, 1980; Berko-kowitz, 1986), readers generate a diagram representing basic ideas and relationships in text. These strategies appear to be at least moderately successful in improving readers' recall of expository text. One limitation of these strategies is that they do not necessarily help the reader identify the macrostructure; the reader extracts a structure, which may or may not represent the gist of the text.

Another approach to teaching text structure is to teach readers to use typographical cues (headings, subheadings, and paragraphs) as indices of text structure. This was the approach used by Taylor and her colleagues (Taylor, 1982; Taylor & Beach, 1984) in their hierarchical summarization research. The hierarchical summarization task consists of first preparing a skeletal outline based on headings, subheadings, and paragraphs, and then writing a main idea statement for every point on the outline. In experiments with fifth-grade (Taylor, 1982) and seventh-grade students (Taylor & Beach, 1984), subjects who completed hierarchical summaries tended to outperform control groups on some kinds of dependent measures. Although the results of the research on hierarchical summarization seem promising, a limitation of the strategy is that it is highly dependent on the heading-subheading organizational format and on the ability of the headings and subheadings to convey the structure of the text.

A third approach to teaching text structure is to provide instruction in one or more conventional text structures. Conventional text structures for expository text include comparison/contrast, cause/ effect, temporal sequence, problem/solution, description, and enumeration (Englert & Hiebert, 1984; Meyer, 1975). There are also conventional text structures for particular genres of expository text, such as newspaper articles and research reports. The potential of instruction in conventional text structures has been demonstrated in a few recent studies. For example, Brooks & Dansereau (1983) identified a structural schema consisting of the categories of knowledge important to understanding a scientific theory. College students trained in the use of this schema significantly improved in their delayed recall of a scientific text. In a study by Barnett (1984), college students who received a brief description of the appropriate text structure before reading either a research report or a journal article recalled significantly more information after two days than either subjects who received the description about text structure after reading or subjects who received no description of text structure. Finally, Bartlett (1978) found that teaching ninth-grade students four expository text structures increased their ability to identify and use the higher-order structure of a text and significantly increased the amount of information they remembered.

In summary, recent research suggests that sensitivity to text structure is an important component in text comprehension and memory, per-
haps because readers who are sensitive to text structure are better able to form macrostructures for the text they read. Furthermore, research suggests that readers as young as fifth-grade can benefit from instruction in text structures.

In the present study, we gave fifth-grade students instruction on a conventional expository text structure (including instruction on summarizing) to see how it would affect their ability to comprehend expository text having this structure. Instruction for the experimental group focused on a problem/solution structure, an organizational pattern commonly found in social studies textbooks. Expository prose with this structure conveys information about a problem that an individual or group encounters, how they attempt to solve the problem, and the results of the attempt to solve the problem. The problem/solution structure is described in our previous study (Armbruster and Anderson, 1985) and is mentioned in many other discussions of expository text structure (e.g., Meyer, 1975).

In the study, children were taught not only to recognize the problem/solution structure, but also to use it in organizing their own written summaries of what they had read. Structure training was compared with the more traditional practice of asking students questions and discussing the answers after reading.

The major hypothesis was that instruction in the problem/solution structure would facilitate the formation of a macrostructure for text with a problem/solution structure. Therefore, compared to the traditionally trained group, the structure-trained group should (a) recall more information on an essay (probed recall) test over the passage main idea, (b) recall about the same amount of information on a short-answer test over specific information not necessarily included in the macrostructure, (c) write summaries that include more passage main ideas, and (d) write better organized summaries (i.e., summaries that have a recognizable structure). An additional hypothesis was that using the problem/solution text structure as an organizational framework for classroom discussion should facilitate students' retention of the content discussed.

Method

Subjects

Fifth-grade students from four heterogeneous classrooms in two schools in a small Midwestern city participated in the study. Children who were enrolled in remedial reading classes or who scored below fourth-grade level on the reading comprehension subtest of the most recently administered Gates-McGinitie Test (2nd edition, Level D, 1978) were eliminated from the study, leaving a total of 82 subjects. Of the two classrooms in each school, we assigned one to the structure training treatment, and the other to traditional training.

Instructional Materials

We prepared “workbooks” for both the structure training and the traditional groups. The booklets for the structure training subjects contained (a) a definition and description of the problem/solution text structure along with a schematic representation (frame) of the problem/solution text structure (see Figure 1); (b) explicit rules for how to write a summary of problem/solution passages, including a pattern for writing and guidelines for checking the summary (see Figure 2); (c) 13 problem/solution passages from fourth- and fifth-grade social studies textbooks, ranging in length from 100 to 500 words; and (d) multiple copies of problem/solution frames accompanied by blank lines for students to use in writing their summaries of the passages.

The booklets for the traditional training group contained the same problem/solution passages as those in the structure training booklets. Each passage was accompanied by five questions. The questions were similar to those at the end of textbook lessons or chapters. Some of the questions were about information critical to the problem/solution structure; thus, they tapped information similar to that which would be discussed in the structure training group. For example, the question “What did Governor Clinton decide to do?” asks about the action taken to solve a problem. Other questions tapped particular facts in the passage that were not critical to the problem/solution structure, as in the question “What two cities were connected...
**Figure 1**
Problem/solution frame

PROBLEM OF ________________________________

ACTION

RESULTS

PROBLEM = something bad; a situation that people would like to change
ACTION = what people *do* to try to solve the problem
RESULTS = what happens as a result of the action; the effect or outcome of trying to solve the problem
by the National Road when it was completed?” Each question was accompanied by four blank lines for answers.

Test Materials

We used two categories of dependent measures for the study. The first focused on learning from independent reading of a problem/solution passage. The second focused on learning from whole-class discussion of a problem/solution text.

Tests of learning from independent reading.
The first criterion test was designed to assess comprehension of the higher-order structure of a 525-word passage about homesteading on the Great Plains, selected from a fifth-grade social studies textbook. The test consisted of an essay question constructed to assess comprehension of the higher-order structure: “What were the problems that settlers faced on the Great Plains? How did they solve those problems?”

The second criterion test was a 10-item short-answer test that tapped more specific information from the passage. Some of the questions probed recall of specific information related to the problems and solutions discussed in the passage. For example, the question “What did the settlers use instead of wood to build houses on the Great Plains?” asks for a specific solution to a specific problem. Other questions probed recall of information not directly related to the problem/solution structure, as in the question “What is a homestead?” Two thirds of the 21 possible points on the short-answer test were assigned to questions that probed recall of information not directly related to the problem/solution structure.

The third criterion test was designed to assess students’ ability to write summaries of problem/solution passages. The materials to be summarized were two 200-word passages selected from fifth-grade social studies textbooks, one on the problem of obtaining food in Haiti, and the other on the problem of getting oil from Alaska.

Tests of learning from structured discussion. The fourth criterion test was designed to assess students’ ability to remember information from a section of their regular classroom textbook which had been read and discussed in class. The section described problems encountered by settlers in Jamestown. The test was an essay question: “Describe two problems that the English colonists faced in the early years of the Jamestown settlement. How did they solve those problems?”

Instructional Procedures

One of us instructed both the structure training and the traditional groups in their normal classrooms with the regular teachers present. The instruction took place over 11 consecutive school days, for 45 minutes per day per class.

The instruction for the structure training subjects followed principles of explicit or direct instruction (Duffy & Roehler, 1982; Pearson, 1984; Pearson & Gallagher, 1983; Rosenshine, 1986; Rosenshine & Stevens, 1984). That is, the instruction featured teacher modeling of explicitly defined procedures, plenty of guided practice on increasingly longer and more difficult passages, teacher monitoring with corrective feedback, and independent practice. Specifically, the structure training instruction proceeded as follows:

Day 1. I (the first author) introduced myself and provided a rationale for the project (i.e., that social studies texts discuss many problems and solutions; so learning about problem/solution structures would help students focus on main ideas and remember important information). Using the first example of a problem/solution text in the workbook, the students discussed answers to the questions “Who has a problem?” “What is the problem?” “What actions were taken to solve the problem?” and “What were the results of those actions?” I explained that these four questions are always associated with problem/solution texts. Then I introduced the problem/solution frame (Figure 1) and told the students the diagram would help them organize answers to the four problem/solution questions. I demonstrated how answers to discussion questions could be recorded in the
Day 2. I conducted a brief review, then led a discussion of the second passage in the workbook, recording answers to problem/solution questions in a frame on the blackboard. I explained to students that one way to learn from reading textbooks is to summarize the information. I explained the guidelines for summarizing problem/solution passages (see Figure 2) and modeled writing and checking summaries based on the two passages already “framed” in the workbook. The students copied the summaries into their notebooks. I then led a discussion of the third workbook passage, recording information in a frame on the blackboard. I elicited a summary from the class and recorded it on the board. The class used the guidelines to check the summary; then the students copied the summary into their workbooks.

Days 3 - 9. Students continued to work consecutively through the workbook, following three steps for each passage: first, they read the passage silently, looking for information to answer the problem/solution questions; then they recorded notes on the passage in the provided problem/solution frames; finally, they wrote a summary of the framed information. Students gradually assumed greater independence in the last two steps. As students worked independently in their workbooks, I circulated and monitored individual work, providing correct...
tive feedback and assistance as needed. Students also were reminded to check their own summaries using the provided guidelines. After students had independently framed and summarized each passage, I asked two or three of them to write their frames and/or summaries on the board. (Sometimes they gave the summaries orally.) The class then discussed and provided feedback on the efforts. By the end of Day 9, all passages in the workbook had been read, framed, and summarized.

Days 10 - 11. Students returned to their classroom textbook, to the place where regular social studies instruction had stopped prior to the intervention. Discussion after silent reading was organized around the problem/solution frame. I recorded the discussion points in a frame on the blackboard; then students summarized the frame orally. (The topic read and discussed on this final day of instruction was the problems of the early Jamestown settlers.)

Meanwhile, the traditional training group worked from their own workbooks for the first 9 days of instruction. Instruction for the traditional training students proceeded in the following manner: After silently reading the passages, the students discussed the answers to the five questions accompanying each passage. To control for effects of practice in writing, I also asked traditional training students to write complete answers to all questions. As with the structure training group, students in this group assumed greater independence throughout the project; I also provided them with corrective feedback and assistance. On the last 2 days of instruction, the traditional training group also returned to the regular classroom textbook and studied the same material the structure training group was studying.

Thus, instruction for the traditional training group was “traditional” in that it entailed reading and discussing answers to questions. The students read the same material as the structure training subjects, to control for practice with problem/solution text structures, and they wrote answers to questions, to control for writing practice.

Testing Procedures

Testing was begun immediately after the 11 days of instruction. On the first day of testing, we asked subjects to read and study the passage “Homesteading the Plains” in preparation for a test. Structure training subjects were encouraged to use the strategy they had been learning. Traditional training subjects were told to use any strategy they wished; notetaking and underlining were mentioned as possibilities. All subjects received blank paper to use in any way they saw fit as they studied the passage. After 18 minutes, the passage and all notes were removed, and the essay question was distributed. Subjects had 12 minutes to answer the essay question. Then the essay question was collected, and the short-answer test was distributed. Subjects had 12 minutes to complete the short-answer test. All 82 subjects completed these two criterion tests.

On the second day of testing, subjects were given one of the two 200-word passages to summarize, and paper containing 50 blank lines. Subjects were told to read the passage and write a summary. They were told that their summary could be shorter, but not longer, than 50 words, and that they should write the summary on the provided paper, using complete sentences. A summary was defined for all subjects as a shorter form of the original passage that contains only the most important points. After 20 minutes, passages and summaries were removed, and the second passage was distributed. Subjects were told to read and study the passage in preparation for writing a summary from memory. After 10 minutes, the passage was removed, and the paper with the 50 blank lines was distributed. Subjects had 10 minutes to write their summaries. For this criterion test, then, one passage was summarized with the text present, and the other was summarized without the text. Eighty subjects completed this criterion test (two were absent).

The final criterion test was administered 6 days after the completion of instruction. Subjects were given the essay question about the problems of the Jamestown settlers. All subjects had read about this topic in their classroom text-
book and had discussed it on the final day of instruction. Subjects were given 15 minutes to write their answers. Seventy-nine subjects completed this criterion test.

Scoring
Two of us independently scored the essay and short-answer tests using answer keys. For the first essay test, the total possible score was 39 points (one point for each of 39 relevant propositions); for the short-answer test, 21 points (one point for each of 21 relevant propositions); and for the second (delayed) essay test, 28 points (one point for each of 28 relevant propositions). Interrater agreement for the first essay test was 89%, for the short-answer test, 96%, and for the second (delayed) essay test, 85%. Disagreements were resolved in conference.

The summaries were scored for relative importance of ideas using the following procedure. First, the two passages were parsed into idea units, which were basically independent clauses. The idea units were listed in the order in which they appeared in the passage. Five adults were asked to read the two passages and then rate the relative importance of the idea units using a modification of the procedure introduced by Johnson (1970). Specifically, the adult raters were asked to place a 1 beside the n idea units (n = 1/4 of the total idea units) that were most important to the meaning of the passage, a 2 beside the n idea units that were next most important, and so on for the four levels of importance. The adult ratings were then averaged to produce a master scoring key for each passage.

Next, the subjects' summary protocols were parsed into idea units. Two of us sorted the idea units from the summary protocols into one of the four categories of importance identified on the master key, or into a fifth category, of extraneous ideas. Extraneous ideas consisted of information that was not present in the original passage, including distortions and intrusions. For a random sample of 50 summaries (about one-third of the total), intrerrater agreement was 94%.

The summaries were also evaluated for quality of writing, using the Rating Guide for Functional Writing as developed for the Illinois Writing Assessment Program (Illinois State Board of Education, 1984). The Rating Guide generates subscores for focus, support, and organization, as well as an overall holistic, or integration, score. Each subscore indexes a different feature of the written piece. The focus score reflects the clarity of the subject and main points; the support score indicates the quantity and quality of the supporting information; and the organization score reflects the use of structure, transitions, and logic in the piece. The integration score indexes the overall development and integration of the features. Each scale has a range of 1 (low) to 6 (high). Typed versions of the summaries were scored blind by two classroom teachers (not otherwise associated with the study) who had been trained by the State of Illinois in this rating procedure. The teachers worked together to score each summary.

Data Analysis
Because students had not been randomly assigned to treatment conditions, the mean reading comprehension ability scores for the four classrooms were computed and compared. Scores on the most recently administered reading comprehension subtest of the Gates-MacGinitie Test (2nd edition, Form D) were used for this purpose. The classroom means (and standard deviations) were 26.2 (5.8), 30.7 (6.3), 30.7 (5.5), and 30.1 (6.3). A one-way analysis of variance (ANOVA) with four levels for the four classrooms showed no significant difference between classrooms; we concluded that there were no major differences in reading ability among the four groups of students. In order to examine the effect of reading comprehension ability, however, we sorted subjects into three ability levels (low, medium, and high) on the basis of their Gates-MacGinitie scores.

Various forms of mixed analyses of variance with unweighted means were used to analyze the data. In all analyses in which the condition of homogeneity of variance was not satisfied, the Greenhouse-Geisser (1959) de-
degrees-of-freedom adjustment factor was used, and the resulting conservative $F$ value was reported. Differences between individual group means were tested by pooling sums of squares and using the Newman-Keuls multiple comparison technique (Glass & Hopkins, 1984).

**Results**

**Learning from Independent Reading**

**Essay test.** Scores consisting of percentage correct of total possible points (39) on the essay test for the passage about homesteading on the Great Plains were analyzed using a $2 \times 3 \times 2$ (school) between-groups ANOVA design. Significant main effects were found for training condition, $F(1, 70) = 7.24$, $p < .01$, and ability, $F(2, 70) = 17.45$, $p < .0001$. According to the Newman-Keuls tests, the structure training group ($M = 37.4$) scored higher ($p < .01$) than the traditional training group ($M = 25.6$). The high-ability students ($M = 46.9$) scored significantly higher ($p < .01$) than the medium-ability students ($M = 32.6$), who scored significantly higher ($p < .01$) than the low-ability students ($M = 15.2$). There were no other significant main or interaction effects.

**Short-answer test.** Percentage correct scores on the 10-item (21-point) short-answer test were also analyzed using a $2 \times 3 \times 2$ (school) between-groups ANOVA design. Results showed a significant main effect for ability, $F(2, 70) = 28.8$, $p < .001$. High-ability students ($M = 68.6$) scored significantly higher ($p < .001$) than medium-ability students ($M = 49.5$), who scored significantly higher ($p < .001$) than low-ability students ($M = 25.8$). No other main or interaction effects were significant.

**Written summaries test—Importance levels.** For the summaries, we were interested in a relative index of how subjects chose to distribute ideas across importance levels, given limited space. Recall that the summary protocols were restricted to a maximum of 50 words; most students wrote to this limit. The protocols were parsed into idea units and sorted into five categories: four normed levels of importance (Levels 1 to 4) and a fifth category for extraneous ideas (Level 5). The score for each category was converted into a "percent of total" metric. Therefore, these repeated measures composed an ipsative, ordered set, in that the sum of all five category scores was equal to 100 for each student, and the levels ranged in importance of idea units from 1 (most important) to 5 (extraneous).

There were five factors in this analysis. The three between-groups factors were the two schools, two training conditions, and three ability groups. In addition, there were two within-subject factors: five levels of importance and two summarizing conditions (with and without text). Because the main dependent measure is ipsative, the test of the experimental hypotheses (represented by the training and summarizing condition factors) is whether there are significant changes in the pattern or profile of the importance factor. Therefore, we are not interested in main effects for school, training, ability, or summarizing condition; the main focus of the analysis is on the interaction of the importance factor with the other four factors.

A significant main effect was found for importance level, $F(4, 272) = 45.5$, $p < .0001$. Subjects included a significantly higher percentage of idea units at Level 1 (most important) than at the other four levels. None of the other four means was significantly different from any other (unweighted $M = 40.6 > 14.7 > 13.1 > 14.9 > 16.8$).

We also found a significant Training $\times$ Importance interaction effect, $F(4, 272) = 17.5$, $p < .0001$. Unweighted means for the structure training group for the five importance levels were $46.7 > 15.8 > 11.6 > 3.5 > 21.7$; unweighted means for the traditional training group were $34.5 > 13.7 > 14.6 > 26.4 > 11.9$. There was a tendency for the structure training group to have more Level 1 (most important) idea units, $p < .001$, and fewer Level 4 (least important) idea units, $p < .001$, in their summaries than the traditional training group. However, the structure training group also included significantly more Level 5 (extraneous) idea units, $p < .05$. 
There was also a significant Importance \times Summarizing Condition interaction effect, $F(4, 272) = 19.07$, $p < .00001$. When subjects wrote summaries with text available, the profile of importance level decreases from a high at Level 1 to a low at Level 5 (unweighted $M = 38.3 > > 21.1 \sim 17.0 \sim 17.7 > > 5.9$). However, when subjects wrote summaries from memory (text unavailable), the profile of importance levels shows many Level 1 (most important) and Level 5 (extraneous) idea units, but few idea units at Levels 2, 3, and 4 (unweighted $M = 42.9 > > 8.4 \sim 9.3 \sim 12.2 < < 27.7$). The means for the two summarizing conditions differed significantly at Levels 2 and 5, $p < .001$.

As shown in Figure 3, there was a significant effect of the triple interaction involving the training, importance, and summarizing condition factors, $F(4, 272) = 3.17$, $p < .01$. As discussed above, the significant interaction of importance profile with summarizing condition is apparent, but superimposed on that interaction is the effect due to training. When the structure training group did not have a text available, they included significantly more extraneous idea units than the traditional training group, $p < .001$; however, both groups included significantly more Level 5 idea units without the text than with the text, $p < .001$.

The interaction between importance level and ability was significant, $F(8, 272) = 4.22$, $p < .0001$. The profiles show that the high- and medium-ability groups performed at about the same level, whereas the summaries of the low-ability group had significantly fewer Level 1 idea units than those of the high-ability group, $p < .05$. For the medium- and high-ability students, the difference between the percentages of Level 1 and of Level 5 idea units was large and significant, $p < .001$. However, the low-ability group showed no significant difference between the percentages of Level 1 and of Level 5 idea units in their summaries.

The effect of the triple interaction between importance level, ability, and summarizing condition was also significant, $F(8, 272) = 2.79$, $p < .01$. As illustrated in Figure 4, the profiles

![Figure 3](image_url)

**Figure 3**

Interaction between summarizing, training, and importance level factors
of importance levels when the text *was* available did not differ significantly between the three ability levels. The profile curves generally decrease smoothly from Level 1 to Level 5. Only the high-ability group included in their summaries significantly more idea units at Level 1 than at any other level, *p* < .001.

Profile curves based on the summaries when the text was *not* available show a very different pattern. For each ability group, the profile curve is U-shaped due to higher percentages of Level 1 and Level 5 idea units. However, the critical difference between these three profile curves is that the summaries of the high- and medium-ability groups included significantly more Level 1 ideas than ideas at any other level, *p* < .01, whereas the low-ability students had a significantly higher percentage of idea units at Level 5 than at any other level, *p* < .05.

**Written summaries test—Quality ratings.** Recall that the summaries were also rated on four dimensions of quality: integration, focus, support/elaboration, and organization. These measures were analyzed in a five-way ANOVA. Three factors—school, training condition, and ability—were between-groups factors, and two factors—quality dimension and summarizing condition—were within-subject factors.

There was a significant main effect of quality dimension, *F*(3, 198) = 59.3, *p* < .00001; unweighted overall means for the four quality conditions of focus, organization, integration and support/elaboration were 2.63 > 2.42 > 1.96 > 1.75. There was also a significant main effect of ability, *F*(2, 66) = 6.8, *p* < .01; the unweighted means for the high-, medium-, and low-ability groups were 2.46, 2.29, and 1.82. Finally, there was a significant main effect of training condition, *F*(1, 66) = 99.8, *p* < .00001. The structure training group received much higher ratings (unweighted *M* = 2.64) than did the traditional training group (*M* = 1.74, *p* < .01).

The effect of the interaction between training condition and summarizing condition was significant, *F*(1, 66) = 6.81, *p* < .05. Although the structure training group wrote better summaries in both summarizing conditions, they wrote slightly better ones with the text available (*M* = 2.71) than without it (*M* = 2.56). On the other hand, the traditional training group wrote summaries that were slightly

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**Figure 4**

Interaction between ability, importance level, and summarizing factors

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lower in quality with the text available (with
text, M = 1.54; without text, M = 1.95).

The significant effect of the interaction be-
tween quality dimension and training condition
shows that the structure training group scored
significantly higher than the traditional training
group, $F(3, 198) = 12.54, p < .00001$, on all
quality categories except the category of sup-
port/elaboration. The mean ratings for the
structure training group on the quality dimen-
sions of integration, focus, support/elaboration,
and organization were 2.34, 3.29, 2.00, and
2.92. The means for the traditional training
group on those same dimensions were 1.59,
1.97, 1.50, and 1.92, respectively.

As for the significant effect for the interac-
tion between ability and quality dimension,
$F(6, 198) = 2.67, p < .05$, the ratings on the
dimensions of integration, focus, and support/ elaboration were not significantly different for
the three ability levels (low, $M = 1.58, 2.31,$
and 1.48; middle, $M = 2.10, 2.81,$ and 1.82;
and high, $M = 2.20, 2.77,$ and 1.97, respec-
tively). On the dimension of organization, how-
ever, the high-ability group ($M = 2.92$) scored
significantly higher than the low-ability group
($M = 1.91$), $p < .01$, but not significantly
higher than the medium-ability group ($M = 2.42$); the mean rating for the medium-ability
group was not significantly different from that
for the low-ability group.

Learning from Classroom Discussion

The percentages of idea units remembered
after a classroom discussion about a problem/
solution passage were analyzed in an ANOVA
with three between-groups factors: school,
training, and ability. We found only a weak
main effect for ability, marginally significant at
$p = .06$, and no significant interaction effect.
Unweighted means for the low-, medium-, and
high-ability groups were 13.7, 14.6, and 21.6.

Discussion

The data analyses provide evidence to sup-
port the major hypothesis that instruction in a
problem/solution text structure, including sum-
marization instruction, would facilitate the for-
mation of macrostructures for text having that
structure. The evidence comes from confirm-
ation of four out of the five hypotheses.

The first hypothesis was that, compared to
the traditional training group, the structure
training group should recall more information
on an essay test over the main idea of a prob-
lem/solution passage. Compared to traditional
training students, structure-trained students re-
called about 50% more of the macrostructure
ideas of a 525-word textbook passage read inde-
dependently. Furthermore, the training was effec-
tive for all three ability groups, for although
there were main effects for treatment and ability,
treatment and ability did not interact.

The second hypothesis was also confirmed.
Although structure training facilitated essay test
performance, it did not affect performance on
the short-answer test. Recall that most of the
items on the short-answer test asked for specific
facts that were independent of the macrostruc-
ture. We did not expect that text structure train-
ing would necessarily facilitate recall of this
type of information.

The third hypothesis was that, compared to
the traditional training group, the structure
training group should write Summaries that in-
cluded more passage main ideas. Indeed, the
structure training group included significantly
more Level 1 (most important) and significantly
fewer Level 4 (least important) idea units in
their summaries. Apparently, instruction in the
problem/solution structure helped students ex-
tract the main points of problem/solution pas-
sages.

However, compared to the traditional train-
ing group, the structure training group also in-
cluded more Level 5 (extraneous) idea units in
their summaries. The tendency for structure
training students to include more Level 5 idea
units in their summaries was especially evident
in the interactions with summarizing condition:
Structure training students tended to include
more Level 5 idea units when the text was un-
available (Figure 3). Also, students of lower
ability, in particular, had difficulty when the
text was unavailable (Figure 4). This effect may
be due to the confounding of summarizing con-
dition with passage (recall that subjects summarized one passage that was available and a different passage that was no longer available). Therefore, differential performance in the two summarizing conditions could be attributable to passage differences. However, we believe that the following explanation is also consistent with these results. The structure training group had learned the kind of information that is included in a problem/solution text and that should be in their summaries; however, in the independent reading situation, it was still up to them to instantiate the frame with the appropriate information. When the text was unavailable, structure training students may have suffered from one or both of the following problems: (a) failure to instantiate the frame with the appropriate information at encoding, or (b) failure to recall the appropriate information to instantiate the frame at retrieval. In other words, when structure training students did not sufficiently understand or remember the actual passage content, they tended to instantiate the problem/solution frame with extraneous information.

An example of a summary text that supports this explanation is the following:

The Alskans had a problem because they couldn't get oil from Texas, therefore they built pipelines as a result the oil was pumped from Texas to Alaska. [sic]

This summary was written by a student from the low-ability group when the text was unavailable. The student has clearly learned to use the problem/solution frame, but is badly confused about the content. (The passage discussed the problem of getting oil from Alaska to other states; Texas was mentioned merely as another oil-producing state.)

The results also confirmed the fourth hypothesis: Compared to the traditional training group, the structure training group should write better organized summaries. The structure training group received much higher quality ratings on the dimension of organization, as well as on focus and integration. However, the significant effect of the ability by quality dimension interaction showed that the instruction was not equally effective for all ability groups. Although the low-ability group did as well as the high-ability group on the dimensions of integration, focus, and support/elaboration, they did not do as well on the important dimension of organization.

We qualify conclusions about the quality of summary writing by observing that the Illinois Writing Assessment Program’s Rating Guide for Functional Writing may not be very appropriate for rating summaries. One reason for our suspicion is that the composite means for the ratings were so low: For the high-, medium-, and low-ability groups, the means were 2.46, 2.29, and 1.82 out of a possible 6 points. Although these low means could reflect relatively poor-quality summaries, they could also indicate an invalid index of summary quality. Another reason for our suspicion is that categories such as focus and support/elaboration do not seem appropriate for summaries. Despite possible problems with the rating scale, however, the scores do appear to reflect relative differences in the quality of the written summaries.

Our final hypothesis was that using the problem/solution text structure as an organizational framework for classroom discussion should facilitate retention of the content discussed. The data do not support this hypothesis. The reason for this result may be that the particular classroom discussion that was the basis for the criterion test was very similar for the structure training and traditional training groups. For both groups, the classroom discussion centered around a selection from the regular classroom textbook about the settlement of Jamestown. The selection was clearly about problems and solutions; in fact, two of the four subheadings were “What problems did these early settlers have to solve?” (problems) and “What new plan helped to make the colony a success?” (actions and results). Therefore, a legitimate classroom discussion of the selection would have to focus on problems and solutions. In fact, the only real difference between the discussions for the treatment groups was that, for the structure training group, we recorded discussion points in a frame on the chalkboard—apparently not a very powerful difference.

Another possible explanation is that students need to be actively involved in the forma-
tion of the macrostructure if they are to benefit from it. In an independent reading situation, students are actively involved; they have to generate the problem/solution structure on their own. In the lecture situation, the class worked collectively to fill in the problem/solution frame; therefore, most individuals were probably less actively involved.

In general, then, the results of this study suggest that direct instruction of a conventional text structure can facilitate formation of a macrostructure for that type of text. Fifth-grade students were successfully taught to form a macrostructure for problem/solution textbook passages read independently, as assessed by both an essay question over main points and a summarization task. For the essay question task, the instruction was effective for all ability groups. For the summarization tasks, the instruction was least effective for the low-ability group. This result is not surprising; other research has demonstrated the difficulty of the task of summarizing, particularly for younger and less able students (Brown & Day, 1983; Brown, Day, & Jones, 1983; Brown & Smiley, 1977, 1978). For students of lower ability, the instruction should probably provide considerably more practice and feedback.

There were two components to the instruction in this study: recognizing a text structure and using a text structure to write summaries. Future research should investigate the distinctive contribution of each component. Meanwhile, as we await further research, the results of this instructional program should be encouraging to educators concerned with reading (and writing!) in content area classrooms.

REFERENCES


Footnotes

The work upon which this publication is based was performed pursuant to contract No. NIE-400-81-0030 of the National Institute of Education. It does not, however, necessarily reflect the views of this agency.

The authors are grateful to Kathryn Ransom, Coordinator of Chapter 1 Reading for the Springfield, Illinois, Public Schools; to teachers Douglas Goss, Phyllis Lape, Margaret Maddox, and William Vickers; and to their students who participated in the study. The authors are also grateful to Barak Rosenshine and several anonymous reviewers for helpful comments on earlier drafts of this paper.

¹In reported means from multiple comparison analyses, the sign $>$ indicates greater than at $p < .01$; the sign $>$ indicates greater than at $p < .05$; the sign $\sim$ indicates no significant difference between means.