DOCUMENT RESUME

ED 365 965 CS 011 560

AUTHOR Dreher, Mariam Jean; Sammons, Rebecca Bell
TITLE Fifth Grade Students' Search for Information in a Textbook. Reading Research Report No. 7.
INSTITUTION National Reading Research Center, Athens, GA.; National Reading Research Center, College Park, MD.
SPONS AGENCY Office of Educational Research and Improvement (ED), Washington, DC.
PUB DATE 94
CONTRACT 117A20007
NOTE 20p.
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Elementary School Students; Grade 5; *Indexes; Intermediate Grades; Reading Comprehension; Reading Research; *Search Strategies; *Textbooks
IDENTIFIERS Questions; *Strategic Reading; Text Factors

ABSTRACT

Fifty-nine fifth-grade students were asked to use an unfamiliar textbook on a familiar topic to locate the answers to three questions, all of which contained terms that could be found in the book's index. As an analysis of covariance indicated, those who were asked guiding questions before and during their search were more successful in locating information than their counterparts who were simply asked to search. Reading comprehension was a statistically significant covariate. An examination of the information-access structures (e.g., index, table of contents) used by students indicated that those who were unsuccessful relied heavily on the table of contents and/or paging through the text despite the very specific nature of the questions. Most students who were successful in completing a search task used the book's index. The guiding questions appeared to have promoted success by increasing the likelihood that students would think of and actually use the index during their search. Although index use did not guarantee success, very few students who did not use the index were successful in answering questions. (One table of data is included; 18 references and the questions along with an explanation of how the questions were related to the answers in the text are attached.) (Author/RS)

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NRRC

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The work reported herein was funded in part by the National Reading Research Center of the University of Georgia and University of Maryland. It was supported under the Educational Research and Development Centers Program (PR/AWARD NO. 117A20007) as administered by the Office of Educational Research and Improvement, U.S. Department of Education. The findings and opinions expressed here do not necessarily reflect the position or policies of the National Reading Research Center, the Office of Educational Research and Improvement, or the U.S. Department of Education.

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National Reading Research Center
Universities of Georgia and Maryland
Reading Research Report No. 7
Winter 1994

Fifth-Grade Students' Search for Information in a Textbook

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Abstract. **Fifty-nine fifth-grade students were asked to use an unfamiliar textbook on a familiar topic to locate the answers to three questions, all of which contained terms that could be found in the book's index. As an analysis of covariance indicated, those who were asked guiding questions before and during their search were more successful in locating information than their counterparts who were simply asked to search. Reading comprehension was a statistically significant covariate. An examination of the information-access structures (e.g., index, table of contents) used by students indicated that those who were unsuccessful relied heavily on the table of contents and/or paging through the text despite the very specific nature of the questions. Most students who were successful in completing a search task used the book's index. The guiding questions appear to have promoted success by increasing the likelihood that students would think of and actually use the index during their search. Although index use did not guarantee success, very few students who did not use the index were successful in answering questions.**

A *search task* is a type of strategic reading that occurs when readers seek specific, goal-related information. In this type of reading, the goal is not to read a book from cover to cover or to learn the contents of a chapter for a test. Instead, readers engaged in search tasks might look up a fact in a reference book, consult a manual for instructions on fixing a leaky faucet, or locate phone numbers of catering services in the Yellow Pages. In other words, readers engaged in search tasks would want to avoid irrelevant information while targeting critical portions. To do this, they might use one or more information-access features, such as an index or table of contents, to go directly to a needed bit of information, disregarding the rest.

Search tasks are common school and workplace demands (Dreher, 1993). In the workplace, adults spend more time reading to locate information than reading for any other purpose (e.g., Guthrie, Seifert, & Kirsch, 1986; Kirsch & Guthrie, 1984; Mikulecky, 1982). And in school, students are also expected to engage in search tasks (e.g., Armbruster & Armstrong, 1993; Armbruster & Gudbrandsen, 1986; Smith & Feathers, 1983). Starting in elementary

school, students use entire books — including textbooks, trade books, and reference manuals — to locate information for report writing and similar tasks. A growing body of research on adults indicates that search performance is considerably less than optimal once tasks move beyond something simple such as looking up the definition of an indexed term (e.g., Dreher, 1992; Dreher & Guthrie, 1987; Dreher & Guthrie, 1990; Guthrie & Dreher, 1990; Kirsch & Jungeblut, 1986; Symons & Pressley, 1993). However, the little information available on children's search performance typically concerns only their skimming of short passages or their ability to answer questions about search-related skills on standardized tests, both of which have limited applicability for the search tasks students usually encounter.

The study reported here examined the performance of fifth-grade students as they attempted to locate information in a social studies textbook. Specifically, the study examined whether one sample of fifth-graders previewed a textbook strategically, whether they knew about a textbook's information-access features, and how successful they were on textbook search tasks.

This study also investigated whether asking students guiding questions before and during a search would affect their success in completing the search task. In work with older subjects, Dreher and Guthrie (1990) found that less successful searchers were unsystematic in their approach. But Dreher and Brown (1993) found that college students were more likely to be successful if they were asked to plan before they engaged in a search task. In research related to children's skill at locating information in books, Kobasigawa (1983) concluded that most fourth-graders and many eighth-graders did not use their existing general knowledge to define search areas in a book unless they were guided to do so. In that study, students were asked what they would do given a research topic and a copy of a book's table of contents, but they did not actually engage in locating information. Nevertheless, Kobasigawa's work suggests that schoolchildren's search performance may be facilitated by guiding questions that, in effect, remind children of available information-access features and search-appropriate behavior.

METHOD

Subjects

Fifty-nine children drawn from the fifth-grade classes of two schools in a large, ethnically diverse mid-Atlantic school system participated in this study. The sample consisted of 31 girls and 28 boys, including 2 Asian Americans, 18 African Americans, 14 Hispanic Americans, and 25 European Americans. Pilot work indicated that the text search tasks were quite difficult, time consuming, and/or frustrating for many fifth-graders. Consequently, we included only those students who were either rated by their teachers as reading at least at grade level *or* whose scale score on a school system criterion-referenced reading test (CRT) was at least 500. This CRT, with a reliability coefficient of .85 (calculated with Kuder-Richardson formula 20), uses a multiple-choice format to assess students' comprehension of short passages of narrative and expository text.

The mean CRT scale score for students in this study was 584 (SD = 57) with scores ranging from 486 to 717; 6 of the students were rated by their teachers as reading below grade level, 33 at grade level, and 20 above grade level. Students who were rated below grade level scored at or above 500 on the CRT; students with CRT scores below 500 were rated as at least grade level readers by their teachers.

Students in this school system are expected to write reports throughout the elementary grades. Group and individual research projects are common, particularly in the intermediate grades. Trips to the library and use of classroom textbooks are frequent as students look for information for their reports.

Materials

Textbook. A U.S. history textbook (McAuley & Wilson, 1989) intended for fifth-graders was used in this study. Although not used at the subjects' schools, it was on the topic of their social studies curriculum and was typical of fifth-grade texts. It contained a detailed table of contents, a glossary, an index, an atlas, and a list of facts about the presidents.

Search tasks. Subjects were asked to search for the answers to three questions. These questions contained key terms that were included in the textbook's index, had answers stated in the textbook, and dealt with topics that had not yet been studied. In order to keep the task to a reasonable time period, the three questions were selected from a larger set of questions used in pilot work. These questions are shown in the Appendix along with an explanation of how the questions were related to the answers in the text.

Procedure

The children engaged in the search tasks in individual sessions of approximately 30 minutes in length. They were told that we needed their help in learning how fifth-graders use books to find things, that some tasks would probably be easy and others hard, that it was not a test or part of their grade, and that their participation was voluntary. The sessions were audiotaped and transcribed. In addition, notes were taken during each session. Each child was asked (a) to preview the textbook, (b) to search the textbook to answer the three questions, and (c) to answer questions about the table of contents, index, and glossary.

Text preview. Before engaging in the search tasks, each child was asked "to look over this book so you can see how it is organized."

Text search tasks. Each search task presented to the children was typed on a white card. The children read each task aloud and were then asked if they already knew the answer. They then attempted to locate the answer. (The few students who reported knowing an answer — see the Results section below — were asked to go ahead and locate it in the book.) If a child was still searching at three minutes, he or she was asked: *Would you like to continue trying to find the answer or do you want to quit and go on to another question?* We offered this option because in our pilot work a number of children searched

unsuccessfully for lengthy periods and became quite frustrated.

Half of the children, at random, were simply asked to search for the answers to the three search task questions. The other half received guiding questions aimed at strengthening the search process. These guiding questions were derived from previous work in which a cognitive model of locating information characterized efficient search as involving (a) formulating a plan of action, (b) selecting appropriate categories for inspection (e.g., index, table of contents), (c) extracting relevant information, (d) integrating extracted information, and (e) monitoring the completeness of the answer (see explications of the model in Dreher, 1992; Dreher & Guthrie, 1990; Guthrie & Mosenthal, 1987).

These guiding questions were asked at three points, as follows:

1) After the children had read each task but before they started to search in the book, we asked them two questions aimed at encouraging them to plan their search: (a) *Before you start, are there words in this question that you might be able to use to help you find the answer?* and (b) *How could you use this book to help you find the information you need?* The former reminded students to identify appropriate key words, and the latter was intended to remind them to identify an appropriate textbook access system. Depending on a child's response, we extended the latter question with some or all of the following questions: (a) *Do you think the table of contents might be helpful?* (b) *Do you think the index might be helpful?* (c) *Do you think the glossary might be helpful?* After students had responded to these questions, we clocked the time they spent on each search task.

2) As the children searched the textbook, we asked them: *What information are you looking for? Does that part seem to have the information you need?* These questions — which were repeated as the children moved to new pages or sections — were intended to help the children to keep their goal in mind.

3) When a child offered an answer, we asked him or her: *Before we go on, read the question again. Do you think you have all the information you need to answer the question, or do you need to search a bit longer?* This question was intended to remind children to evaluate their answers and to continue searching if the answers were not complete.

Textbook features. After the children had attempted all three search tasks, they were asked about the table of contents, the index, and the glossary. They were asked to tell what each is for and to find it in the textbook. (Children who could not find a feature were shown where it was.) Once they had arrived at a feature, they were asked to use it. For the table of contents, we asked: *Can you tell me how many chapters this book has?* For the index, we asked: *Can you find the entry for transportation and explain how that entry works?* For the glossary, we asked: *Can you find the entry for cash crop and explain how that entry works?* Because these questions could have reminded the students of the available information-access features, they were asked after they had done the search tasks rather than before.

RESULTS

Background

The children in the guiding question (GQ) group and the no-GQ group did not differ on criterion-referenced reading test (CRT) scores [M = 588, SD =59; M = 583, SD = 57, respectively; $t(55) = .32, p > .05$]. In addition, the groups did not differ on the amount of time they spent previewing the textbook [M = 58 s, SD = 14 s, M = 54 s, SD = 11 s, respectively; $t(59) = 1.14, p > .05$]. Nor did the groups differ on reported prior knowledge of the answers to the search questions [M = .10, SD = .24; M = .06, SD = .13, respectively; $t(56) = .92, p > .05$]. There were 13 positive responses when the students were asked whether they knew the answer to a search task question. These responses, mainly given for the horse question, were usually incorrect. It should be noted that general background knowledge relevant to the search tasks was not examined because it was not pertinent to the purposes of this research. However, the random assignment of the students to the treatment groups makes it likely that such knowledge was evenly distributed between the groups.

When we asked the students to preview the book's organization, we coded their activities according to whether they examined the table of contents, the index, the glossary, or the body of the textbook. For each textbook feature, a chi-square analysis contrasted its use or lack of use by group. The students assigned to the two conditions engaged in the same activities during the preview (which took place before the guiding questions were begun). Overall, 54% of the students examined the table of contents, 20% the index, 12% the glossary, and 95% the body of the textbook. (This analysis made no distinction between, for example, glancing at a table of contents page or attending closely to the table of contents; see the strategy analysis of preview activities below.)

Search Task Success

As shown in Table 1, when guiding questions were asked, fewer children were unable to locate the answer to any search task question. Indeed, the percentage of students who were successful on two or three of the tasks rose from 31% with no guiding questions to 52% when guiding questions were asked.

The performance of the GQ and no-GQ groups was compared using an analysis of covariance, with the number of correct search tasks as the dependent variable and CRT scores as the covariate. The mean number of correct search tasks was .97 (SD = .91) for the no-GQ group and 1.5 (SD = .95) for the GQ group. The guiding questions produced a statistically significant improvement in search performance [$F(1,51) = 4.20$, $MS_e = .68$, $p < .05$] and CRT score was a statistically significant covariate [$F(1,51) = 15.09, p < .001$]. Due to lack of CRT scores for some children, analyses using that variable involved 54 children, 27 in each group.

The mean search time for students in the GQ group was 204 s (SD = 68) per task versus

164 s (SD = 67) for no-GQ students. This time difference was statistically significant [$t(56) = 2.27, p < .05$]. However, mean time was not correlated with success rate (r = -.22, p = > .05).

Textbook Features

Chi-square analyses were used to contrast each group's responses to questions about the table of contents, index, and glossary. These analyses found no statistically significant differences on these features by group. Eighty-eight percent of the students were able to explain what a table of contents was for and 93% were able to find the table of contents in the book. Seventy-one percent could use the table of contents to determine the number of chapters in the book; another 14% mistook the number of units for chapters. Sixty-nine percent of the students were able to explain what an index was for; 82% could locate the index; and 85% could locate an entry in the index. Fifty-six percent were able to define what a glossary is, 75% could locate the glossary; and 98% were able to locate an entry in the glossary. Students who could not locate the table of contents, index, or glossary were shown the feature before being asked to locate an entry in it. (It is, of course, possible that students may have performed better on finding these features than they would have if they had been asked to locate them before the search tasks.)

Table 1. Number of Correct Search Tasks by Group

Guiding Questions	Number of Search Tasks			
	0	1	2	3
No	11 (38%)	9 (31%)	8 (28%)	1 (3%)
Yes	5 (17%)	9 (31%)	11 (38%)	4 (14%)

Note. N=58 (29 each group). One child in the GQ group was unable to complete all 3 tasks because of time constraints. Because this table shows how many tasks out of 3 were correct, this child is not included here.

Strategy Analysis

Transcriptions of each students' search session were produced from audiotapes in conjunction with field notes. These data were analyzed for the strategies the students exhibited as they previewed the organization of the book and as they did the search tasks.

Previewing the textbook's organization. As noted, preview activities took place before guiding questions were asked and did not differ between students assigned to different groups. Using transcriptions and notes made during the search sessions, two independent raters classified the students' preview activities as strategic or non-strategic. Although there were some differences between the raters on the ranking of students within each category, there were no disagreements on placement of students in the two broad categories of strategic and non-strategic.

Thirty-two of the 59 students (54%) were classified as at least somewhat strategic during their textbook preview. These students examined one or more information-access features,

often verbalizing an intent to learn about the organization and/or content of the book. For example, one student turned to the table of contents and read through the entries. When asked what she was looking for, she replied "I went through the table of contents and I was seeing where everything is." Another student paged through the table of contents, then turned to the back of the book and paged backwards through the index, glossary, and pictures of the presidents.

Twenty-seven students' (46%) preview activities were classified as non-strategic. These students examined only the body of the text, not the text's information-access features. Some, for instance, looked at a few pages in the front or back half of the text. Others turned through the body, picked a chunk of the text and paged backward through it, repeating this process a few times. A few students appeared to have little idea what to do during the preview. For example, one student responded to the request to look the book over to see how it was organized by asking "Well, how am I supposed to know what pages to look on?" When told that he could look anywhere he wanted, he began turning text pages but paid little attention to their contents as he looked around the room and at the researcher. Another student spent the entire time reading page 6.

Search task process information. For each search task, children's records were examined to determine whether they used the table of contents, the index, or the glossary, whether they examined text pages, and whether they looked back at the search task. For each of the three search tasks, the pattern was the same: no differences between groups except on index use. On the *horse* task, students in the GQ group used the index 60% of the time, while students in the other group used the index 28% of the time [$X^2(1, N = 59) = 5.04, p < .05$]. For both the *Seward* question and the *Lewis and Clark* question, 83% of the GQ students used the index in contrast to 45% of the no-GQ students [X^2 $(1, N = 59) = 7.93, p < .01$; X^2 $(1, N = 58) = 7.46, p < .05$, respectively].

Although use of the index did not guarantee success, the likelihood of finding the answer was greatly reduced when the index was not used. For children who did not use the index, the mean success rate was only 11% (8 successes out of 75 instances in which the index was not used). In contrast, the success rate was 62% for those who used the index (63 successes out of 101 index uses). Thus, almost all the successful students were successful via the index. Some successful students were very efficient: they identified an appropriate key term, looked it up in the index, went directly to the indicated page in the text, and found the answer. Others searched the table of contents and/or the text, but eventually settled on the index.

Sources of difficulty during text search tasks. Two independent raters analyzed the transcriptions of unsuccessful searchers' actions in order to gain insight into the sources of the difficulties these students experienced. The few disagreements between the raters were resolved in conference. By far the most common problem was attempting to locate the

answers by using the table of contents or by paging through the text. In 69 of 105 unsuccessful searches, students (20 GQ, 49 no-GQ) examined the table of contents or paged through the text or both; none of these searches involved the index.

In another 29 instances, unsuccessful searches did involve index use. In 6 unsuccessful searches (3 GQ, 3 no-GQ), children found the index page for the key word they were seeking, but the key word either was not in the index (*expedition*) or was not helpful (*North America*). In 7 cases (6 GQ, 1 no-GQ), children located an index page containing a correct key word (e.g., *Lewis and Clark*), but could not locate the entry. One unsuccessful search involved a child who located a correct index page, as well as the correct entry, but was unable to proceed to the text page. Interestingly, 15 students (12 GQ, 3 no-GQ) were unsuccessful, despite using the index, because they attempted to look up Seward by his first name (4 of these students eventually examined the correct index page, but still did not locate Seward). Finally, 7 unsuccessful searches occurred when children (2 GQ, 5 no-GQ) located a correct text page, but could not extract the answer.

DISCUSSION

Most of the fifth-graders who participated in the study were able to define and locate a textbook's information-access features. Furthermore, just over half of these fifth-graders were judged to have previewed the textbook at least somewhat strategically when asked to note how it was organized. Yet 45% of these students could not make appropriate use of the opportunity to preview the book they knew they would be using to search for information. When they were asked to locate stated-in-the-book answers to questions containing indexed terms, many children had difficulty. However, guiding questions facilitated success in searching.

It should be recalled that children rated as below-grade level readers did not participate in this study. Thus, it is likely that less able readers' search performance would be lower than was exhibited in the current study because such students would have the additional burden of searching in an on-grade level textbook. Indeed, reading comprehension performance was a statistically significant covariate with search success. Hence, facility in reading comprehension is certainly helpful in search performance. But the need for instruction targeted at the type of strategic reading involved in text search is suggested by the types of difficulties experienced by the unsuccessful searchers in this study. Most chose approaches — such as perusing the table of contents or paging through the body of the text — that were not tailored to the specific tasks they were asked to complete. For the others, search broke down during information extraction: they located the appropriate text section or index page, but were unable to recognize the needed information.

Although the guiding questions increased the mean time on task, success and time on task were not correlated. Instead, the effect of the guiding questions was associated with an

increase in the likelihood that a student would use the index, and index use greatly improved the chances of locating the answer. Without the guiding questions, students often relied on the table of contents and/or paging through the text, not very productive approaches when key words are available. It might be argued that the guiding questions directed the children to use the index; however, these questions also involved asking children about the use of the table of contents and the glossary. Thus, instead of telling students which feature to use, these questions most likely served as reminders of available information-access features, including the glossary, which in this case was not useful.

The effect of rather simple, non-instructive guiding questions in facilitating search performance suggests that many children had knowledge about information-access systems that they were not using automatically. Certainly, search-related instruction is included in teachers' manuals for textbooks (cf. Armbruster & Gudbrandsen, 1986) and in school system curriculum guides for elementary school. Moreover, the teachers whose students participated in the current study indicated that they believe they have taught the skills their students need. For instance, when a new textbook is introduced, teachers typically go over its features. As a teacher pointed out, "They should be able to do that. We've covered it." Similarly, a reading specialist at one of the schools quizzed us about our study and then asserted that, based on the curriculum, all the students should be able to complete the tasks with ease.

But the success rate was only about 50%, even for children who received the guiding questions. Hence, more is involved in improving search performance than simply helping kids to remember what they already "know." As Cole and Gardner (1979) concluded, "children need help and guidance in a real context to convert the verbal knowledge to behavioural competence" (p. 191). Cole and Gardner based their conclusion on such findings as that British first-year secondary school students could explain the use of a table of contents and an index, but rarely used such features in their project work. Similarly, although the teachers involved in the current study indicated that they believed they had taught the skills their students need, they also expressed dismay (in general, not specific to this study) at many of their students' lack of facility in accessing information. For example, one teacher noted that many of her fifth-graders will page through library books related to their report topic, focusing mainly on the pictures, and then conclude that the books do not contain what they need. Another commented that teachers must teach the same thing over and over.

Thus, research is needed on improving instruction related to reading to locate information. A productive approach may be to examine search strategy instruction that is integrated with the demands of regular social studies research projects rather than teaching search-related skills in separate units, as is often the case. In this way, the likelihood of transfer of instructional concepts to actual search behavior may be enhanced.

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APPENDIX

The Search Tasks in Relation to the Relevant Text

How did horses come to North America?

Index entry: horses, in North America, 312
[North America is also indexed but has no subhead for horses.]

The index entry leads to a page with a section titled **The Indians' Last Stand.** After a one-paragraph introduction, a subhead reading **The Indians' Way of Life** occurs. The answer is stated in the second sentence under that subhead: "Then, in the 1500's the Spanish brought the first horses to the Americas" (McAuley & Wilson, 1989, p. 312).

In 1867 William Seward bought some land for the United States. What is the name of the land he bought?

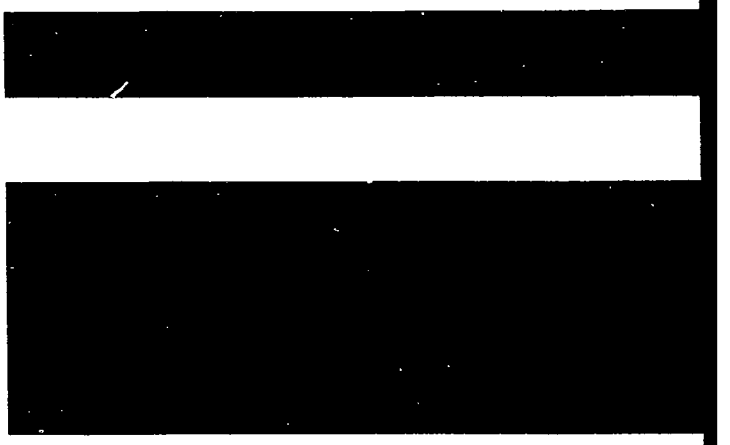
Index entry: Seward, William H., 348

The index entry leads to a page with a section titled **Expanding the Nation.** After a one-paragraph introduction, a subhead that reads **Buying Alaska** occurs. The answer is stated in the first paragraph under this heading: "The first such territory was Alaska. Until 1867, the Russians ruled Alaska. They had a colony there since the 1700's. In 1867, they offered to sell it to the United States for $7,200,000. Secretary of State William H. Seward jumped at the chance to buy so much land for less than two cents an acre" (McAuley & Wilson, 1989, p. 348).

Almost 200 years ago the Lewis and Clark expedition left St. Louis, Missouri to explore some new land that the United States had bought. What places did they explore?

Index entries: Clark, William, 250-252
Lewis and Clark expedition, 250-252
Lewis, Meriweather, 250-252
St. Louis, Missouri, 248, 250, 252

The first index entries listed above lead to a page with a section titled **Beyond the Mississippi.** After a two-paragraph introduction, a boldface heading **The Adventures of Lewis and Clark** appears. This section spreads across 2 1/2 pages with 4 boldface subheads (**Up the Missouri, In the Land of the Mandans, In the Land of the Shoshoni,** and **Reaching the Pacific**). For the current analysis, the question could be answered by "the northwestern part of the Louisiana Purchase" in the first line in the second paragraph under **The Adventures of Lewis and Clark** heading. But a more complete answer would involve at least the 4 subheads (e.g., up the Missouri River into what is now North Dakota, then over into what is now Montana, across the Rocky Mountains, and on into what is now Oregon and the Pacific Ocean).



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