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AUTHOR   Dreher, Mariam Jean; Davis, Kathryn Ann; Waynant, Priscilla;
                Clewell, Suzanne F.
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ABSTRACT
        A study examined the effectiveness of research strategy
instruction that is integrated with the demands of inquiry-based content-area
projects, rather than the typical teaching of research-related skills out of
context. The study was conducted at two elementary schools, one a Title I
school with a high percentage of poor readers, the other a school with a
predominantly middle class population with fewer students who were poor
readers. Participants were fourth graders: at the Title I school there were 7
girls and 6 boys, and at the other school, there were 15 girls and 11 boys.
The classroom context was designed collaboratively by a research team
consisting of a teacher, a university faculty member, a reading/language arts
coordinator, and an instructional specialist. Instruction was done by the
classroom teacher alone at one school, but the teacher at the Title I school
was supported by the research assistant. Results indicated similar patterns
at both schools with performance assessments showing no differences on prior
knowledge of the assessment topics, but provided evidence of statistically
significant improvements in students' ability to find and use information.
Students demonstrated improvement in their ability to: (1) search
independently for information; (2) write a response to a research question
based on that search; and (3) apply what they had learned to a new problem.
(Contains three tables of data and 10 references; appended are examples of a
performance rubric and categories of advice for a specific research problem.)
(CR)

Fourth-Grade Researchers: Helping Children Develop

Strategies for Finding and Using Information

Mariam Jean Dreher

University of Maryland at College Park

Kathryn Ann Davis

Priscilla Waynant

Suzanne F. Clewell

Montgomery County Public Schools

Running head: Fourth-grade researchers

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Fourth-Grade Researchers: Helping Children Develop Strategies

for Finding and Using Information

Elementary school curriculum guides, teachers' manuals, and outcome lists all include goals related not only to reading exposition but to finding and using information. Further, it is common for elementary school teachers to teach research-related skills such as alphabetical order, headings, notetaking, and index key words, and to assign reports on a myriad of topics. Yet it is also common to hear teachers complain about their students' difficulties with research-related activities. "Good" readers flip through books on their topic, ignoring the index or table of contents, only to discard the books because there is "nothing" in them. Similarly, some students drop what they want to find out because they can't find it quickly. Others copy a source word for word. Still others waste their work periods on resources that are unlikely to have the kind of information they need. Many of these students have done well on worksheets related to the activities in which they are engaged. But as one teacher said recently, "We have to teach it over and over and over."

Research confirms such anecdotal evidence. Dreher and Sammons (1994), for example, found that fifth-graders (all at least "grade level" readers) had great difficulty using a familiar-topic textbook to locate the answers to questions which contained terms that could be looked up in the index. Students' search patterns indicated that most failed to succeed because they did not think to use the index. But even some of those who tried the index looked up inappropriate terms or tried first

names instead of last names. Typically, children who were unsuccessful tried to locate the answers to these very specific questions by using the table of contents or paging through the book. Yet these student had been taught about information-access features, and when asked to do so, they could find the index, contents, and glossary and explain their use.

Other research documents similar patterns in which even capable readers seem unable to make independent use of what they have been taught. Wray and Lewis, for example, interviewed children and then observed them as they worked on a research project; they noted "a large gap between what children said about how they would use information books and what they actually did when using them" (1992, p. 20). These and other results (e.g., Dreher, 1995; Kobasigawa, 1983) suggest that children have difficulty transferring the research-related lessons they are taught to their everyday independent repertoire of strategies.

How can we help students develop independent, flexible strategies for finding and using information? Children such as those in the cited research have been exposed to research-related instruction -- that fact is obvious in that they can answer questions about information-access features, and can often use such features when prompted (even if they do not do so spontaneously). However, to produce more than inert knowledge (e.g., Bereiter & Scardamalia, 1985), we need to provide systematic guided practice in a meaningful context so that children are more likely to transfer their verbal knowledge to usable strategies.

Consequently, the current research focused on improving instruction related to finding and using information. Specifically, in a year-long intervention study, we

investigated the effectiveness of research strategy instruction that is integrated with the demands of inquiry-based content-area projects (e.g., Blumenfeld et al. , 1991; Brown, 1992), rather than teaching research-related skills out of context as is typically the case. Such an approach is important for all children, given the difficulties evidenced in the literature even by children who have received research-related instruction. But such instruction is particularly critical for low-achieving readers who typically get little exposure to either exposition or research (Chall, Jacobs, & Baldwin, 1990).

Hence, we conducted our research at two elementary schools, one a Title I school with a high percentage of poor readers, the other a school drawing largely from a middle class population, with fewer students who were poor readers. Our purpose was to investigate whether the instructional context we created would improve independent research performance at both schools. We devised performance assessments to allow us to describe students' independent performance on understanding a research question, locating appropriate information, writing a response, and applying learned content to a new situation. We also interviewed the children about the research advice they would give others.

<div align="center">Method</div>

Participants

The participants were fourth graders in two elementary schools during a year of instruction. School 1 draws its students from a largely white, middle class population. The 26 fourth-graders at School 1 consisted of 15 girls and 11 boys, with 1 African-American child and 25 who were white.

School 2 has substantial Title I funding, and a diverse population with a high number of African-American students and a large percentage of students from homes in which Spanish is the first language. At School 2, we began the year with 18 children who attended class all day. (Other children joined the class most of the day, but attended ESOL class during these activities.) During the year, five students moved, and three new students joined the class. Thus, there were 13 students who participated for the entire year; these students consisted of 7 girls and 6 boys, with 7 being African-Americans, 5 Hispanic-Americans, and 1 of Indian origin.

Instruction

The classroom context was designed collaboratively by a research team consisting of a teacher, a university faculty member, a reading/language arts coordinator, and an instructional specialist. The activities during the school year reported here were preceded by over a year of prior work in which the research team engaged in action research on research-related instruction. The teacher at School 1 was intensely involved in developing the approach. She is a teacher with over 20 years experience and a keen interest in social studies, the main vehicle for this instruction. The other teacher, with 3 years experience, implemented the approach developed at School 2. The university faculty member and school system support staff met regularly with the teachers. The faculty member and a graduate assistant were frequently in the classrooms as observers and consultants. At School 1, all instruction was done by the classroom teacher. At School 2, the teacher implemented most of the instruction, but was supported by the research assistant,

an experienced teacher, who observed and discussed lessons with the teacher and who taught occasional model lessons.

At each school, research activities and instruction were situated in integrated social studies units. These units were inquiry based (Blumenfeld et al., 1991), involving reading and writing in both individual and collaborative tasks. Instructional activities included research projects that drew on classroom, school, and public library resources to involve children in extensive use of such resources as textbooks, tradebooks, primary sources, electronic media, brochures, interviews, and videos. The content reflected the school system's fourth-grade curriculum on state history, including such topics as regional Indians, colonial craftsmen, black history, women's history, and counties of the state.

For all projects, a key element was an emphasis on the research process as being as important as the products of research. Teachers helped children see the components of the research process by helping them formulate a research model which was posted in the classroom. This model consisted of asking questions, gathering information, organizing information, creating a rough draft, revising and polishing, preparing a visual aid, presenting, and evaluating. Although we emphasized that the research process is recursive rather than linear, referring to the model helped students see how the steps they engaged in were related to the overall project, and helped them determine where they were in a project and what they needed to do next.

Research projects, on-going throughout school year, were an integral part of instruction, facilitating the integration of reading, writing, and social studies.

Substantial time was devoted to research work sessions. The typical format during such a work session included: (a) a focus lesson on a research process problem identified during previous sessions, (b) a review of the research process strategy model, (c) a work period, (d) an end-of-session collective share in which students reported what they tried, what worked, and what difficulties they had, and (e) a Reflections Book entry.

The Reflections Book consisted of a spiral-bound booklet containing reflections pages. Used at the end of each work session, each reflections page has four parts. For Part 1, students checked off which part(s) of the research process they worked on during that day's session (forming a research questions, searching for resources, etc.). For Part 2, students wrote or drew what they did as they worked on some portion of the research process that day. Parts 3 and 4 were aimed at helping children become more reflective about their strengths and needs as they engaged in research. In Part 3, students indicated what was hard and what was easy about the research process that day. In Part 4, students filled in the statement, "I think a good topic for the next lesson would be _____ because _____."

Focus lessons were identified from classroom interactions, collective sharing sessions, and Reflections Book entries. Focus lessons were taught in the context of an ongoing project and were tied to the specific needs of the children working on a particular project.

In a typical week, students were involved in both research work sessions and in what might be termed "regular" social studies instruction in which the focus was

on gaining understanding of an historical period or concept. Typically, two periods in a week might be described as regular social studies instruction, while the other three days involved research work sessions. These sessions overlapped in that the concepts learned during regular sessions facilitated research on a topic, and research projects produced content learning as well as research skill.

For example, the first two periods on a new unit might begin with 2 days of introductory activities involving students in learning about the new material through such methods as videos, guest speakers, textbook reading and discussion. Such periods usually lasted about 30 to 40 minutes each. Next, the teacher might introduce a research project for the unit. This research project would be carried out during several work sessions that ranged between 45 to 90 minutes each. Research sessions and regular sessions were interspersed according to the length of the project. Some projects lasted a few days and some 2 or 3 weeks.

Critical factors in our approach include (a) a process emphasis in which the teacher helps students see the research process as a whole and helps them see how the individual components of the process fit together and interact recursively, (b) an emphasis on students reflecting on what they are doing, why they are doing it, and what problems and successes they are having, and (c) an emphasis on using the teacher's observations and students' reflections to make research-related instruction meaningful.

Measures

Performance assessments. The students completed a performance assessment in late September, and a parallel assessment in May. These assessments centered on

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a research task that involved either finding information on a plant that was useful to the southwestern Indians or finding information on the usefulness of an animal brought to the New World by the explorers.

These performance assessments were modeled after those used by Guthrie et al. (1996) in their Concept-Oriented Reading Instruction (CORI), an approach to teaching reading and writing using science content. As in the CORI research, each assessment consisted of several tasks in which students (a) stated their prior knowledge by drawing and labeling what they knew about the topic, (b) searched for information about a research question, (c) wrote answers to the research question, and (d) wrote answers to a problem requiring them to apply what they had learned to a new situation.

The assessments used in the current study differed from those used in the CORI project both in content (social studies vs. science) and in the nature of the search tasks students were asked to perform. In the CORI study, students searched for information in a booklet containing 2-to-4 page excerpts from information books. In contrast, in the current study students were asked to locate their own sources in a room containing diverse resources.

Interviews. Students were interviewed in late September and in May about research-related reading. This structured interview opened in the fall with questions about what students remembered and what they liked or disliked about research projects in past grades; in the spring the opening questions involved reflecting on the current school year's research projects.

Next students were asked questions about finding information. One question dealt with tips they would give other fourth graders. In the fall, they were asked: "What if Mrs. __ asked you to give the class advice on finding information. What kinds of tips would you give them? Anything else?" In the spring, the first part of the question was altered to, "What if Mrs. __ asked you to come back next year and give her new fourth graders class advice on finding information."

Another question involved students responding to this scenario (matched to the sex of the interviewee):

Pretend a new girl transfers into your class. You are talking to her at recess and she says she has made a bet with her brother and needs to find out how high the tallest mountain in California is. You go with her to the library. She finds a book on California and starts reading on page one. She sighs and says, "Well this is going to take me a long time." Do you have any advice for her?

The spring version of this scenario was parallel in form but dealt with a different topic.

Administering and scoring the measures

The performance assessments were administered to small groups over four-day period in an empty classroom. This room was set up attractively with posters, magazines, library books, encyclopedias, and teacher-prepared materials. Some of this material was appropriate to the research problem and some was not. Half of the students were randomly assigned to one of the two topics in September; the topics were reversed in May.

At the beginning of the assessment, the teacher set a context by having children listen to a scenario involving explorers. The children then imagined they were among a group of explorers in a location related to their assessment topic. Then they drew and listed the plants and animals they might have seen as they explored the region for useful resources.

During the performance assessment, we read all directions with the children. As they searched for information, we assisted children if they asked for help in reading words. Occasionally children would ask what a word meant as they searched; we told them. But we did not tell children whether or not a selected resource was an appropriate one. As children completed each task, we gave him or her directions to the next part.

All responses to the various phases of the performance assessment were scored according to rubrics constructed by an inductive-analytic method. A sample of responses was sorted into categories that seemed to be reproducible. Then a second sample of responses was used to evaluate and modify the categories. Another rater then evaluated the students' responses

The interviews were conducted in a quiet room by the graduate student who took notes and tape recorded the interviews. Responses to the interview were analyzed in the same manner as the performance assessments.

<div align="center">Results</div>

Performance Assessments

As noted, performance assessment topics were counterbalanced with half the students receiving one topic in the fall and the other topic in the spring, and the

other half receiving the two topics in reverse order. Because preliminary analyses indicated no differences in performance on the two topics, the results are presented with data for the two topics collapsed. Table 1 presents the means and standard deviations on each stage of the performance assessment. (In considering the performance assessment means, it should be noted that of the five School 2 students who moved, three scored at the lowest levels on almost all components of the fall assessment. Thus, the means for School 2 would likely be lower had those students remained for the spring assessment.)

Prior knowledge. Students' responses were rated from 1 to 4 using a rubric based on the amount of prior knowledge they demonstrated. There were no differences in prior knowledge in the fall and spring at School 1 [$t(23) = -.39, p = .71$] or School 2 [$t(12) = .62, p = .55$].

Insert Table 1 about here

Search for information. Fall and spring research logs were rated from 1 to 4 using a rubric (see Appendix A) which took into account the degree to which students used appropriate resources and took notes on the appropriate information as they engaged in independent search for information. Paired sample t-test indicated that spring scores were statistically significantly higher than fall scores at both School 1 [$t(23) = 4.98, p < .001$] and School 2 [$t(12) = 5.52, p < .001$]. The effect size was .84 for School 1, and 1.3 for School 2. (Effect sizes were calculated for each variable by subtracting the fall mean from the spring mean, and then dividing that value by a denominator based on the square root of the average of the fall and

spring standard deviations. This denominator was used to make the effect size comparable to an independent group effect size.)

Writing answers to the research question. When the children had completed their search for information, they used their logs to help them write answers to the research question. These responses were rated from 1 to 5 based on their degree of accuracy and development. Paired sample t-tests indicated that spring scores were statistically significantly higher than fall scores for both School 1 [t(23) = 12.46, p < .001] and School 2 [t(12) = 4.45, p = .001]. The effect size was 1.5 for School 1, and 1.3 for School 2

Application. The children were also asked to apply what they had learned to another situation. These responses were rated from 1 to 5 based on their degree to which they addressed the question and developed their response. Paired sample t-tests indicated that spring scores were statistically significantly higher than fall scores for both School 1 [t(23) = 13.29, p < .001] and School 2 [t(12) = 4.63, p = .001]. The effect size was 1.8 for School 1, and 1.4 for School 2

Interview

Both fall and spring interview data were available for 23 children at School 1 and 11 children at School 2.

Tips for other fourth graders. Students' responses when they were asked to give other fourth graders advice on finding information, fell into three categories. First, responses which included advice to use a research-related strategy were classified as strategy advice. These responses may also have included resource and/or general work advice tips, but all included strategy suggestions such as "If the

first resource doesn't work, look for another resource." Second, responses which included suggesting resources that might be used for research were categorized as resource advice. These responses may also have included general work advice tips, but did not include research-related strategies. For example, a student suggested using one or more of resources such as books, magazines, encyclopedia, computer. Third, general work advice included response that offered general advice but nothing specific to research strategies or resources that might be used. For example, students suggested "get it over fast" or "you might get frustrated, but you have to do it."

In the fall, as can be seen in Table 2, most students' advice to other fourth graders took the form of suggesting resources. Seventy-four percent of the fall responses at School 1 and 73% at School 2 were resource suggestions. These responses typically involved suggesting that other students use one or more resources such as encyclopedias, library books, dictionaries, magazines, and computers.

In the spring, the pattern in each class shifted to responses that included strategy advice, with 91% of School 1 and 82% of School 2 responses falling into this category. In the spring, students often continued to give resource advice, but they included strategy advice along with resources. For example, one student suggested using books and CD encyclopedia. But rather than simply suggesting the use of these resources, as was characteristic of fall responses, this student included instructions to "first find a book that has a title that sounds like it would have your topics. Then look up your topic in the index or the table of contents. You can also use the CD

ROM. Try lots of different things on the 'search' to get what you need." Similarly,

another student advised others to write the source of their information in their

notes so they don't forget and to "use the index. It's faster" instead of the table of

contents.

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Insert Tables 2 and 3 about here
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Advice on a specific research problem. Appendix B lists the categories used to

classify students' responses when they were asked to give advice to a new classmate

with a specific research problem. As Table 3 indicates, students' responses covered a

wide range of suggestions in the fall, but converged on suggesting the use of the

index and table of contents in the spring.

At School 1 in the fall, 11 children (48%) included mention of using the index

and/or table of contents, while the remaining children's responses ranged widely

from advice to get another book to looking for appropriate pictures. At School 2 in

the fall, no one mentioned the index. But 2 children (18%) suggested using the table

of contents. As at School 1, the remaining responses of the children at School 2 were

diverse, as is evident from the examples in Appendix B.

In contrast, by the time of the spring interview, most children's advice at both

schools had become a good deal more specific. At School 1, all but two children

advised the use of an index or both the index and table of contents. Similarly, at

School 2 only one child failed to recommend an index and/or table of contents.

Discussion

This intervention study examined the effectiveness of research strategy instruction integrated into inquiry-based social studies projects on the independent research performance of fourth graders, as well as their ability to give advice about research. The results indicate similar patterns at both a Title I school and a middle-income school. At each school, performance assessments indicated no differences on prior knowledge of the assessment topics, but provided evidence of statistically significant improvements in students' ability to find and use information. Students demonstrated improvement (a) in searching independently for information, (b) in their ability to write a response to a research question based on that search, and (c) in their ability to apply what they had learned to a new problem.

In addition, interview responses indicated a sharp increase during the course of the year in the specificity of the advice children at both schools offered to a student with a specific research problem. Similarly, at both schools, when children were asked to offer advice to a fourth-grade class, they demonstrated a dramatic shift from listing resources to offering research-related strategy advice. In light of previous research (e.g., Wray & Lewis, 1992) in which children are much better at saying what they would do when compared to actually doing it, these interview data must be viewed with caution. However, the interview data are supported by students' demonstration of independent research behavior on the performance assessment.

A strength of this study is the use of performance assessments in the form of realistic research tasks, tasks very much like what might be assigned in a typical classroom. As noted earlier, in the CORI work (Guthrie et al., 1996), students

searched for information in a researcher-constructed booklet of information book excerpts. In the current study, students were asked to locate their own sources in a room containing diverse resources. Although important information can be obtained with both kinds of tasks, the type of authentic tasks used in the current study may offer data more reflective of what students actually do in classroom or library research, and it may be more like what teachers make available in their own classrooms. Future research should explore the strengths and limitations of these differing types of tasks.

This study is limited by the fact that we did not compare the change that occurred in these two classrooms to comparison classrooms. Thus, we cannot rule out the possibility that the growth such as we observed might have occurred in classrooms not receiving this type of instruction. Although previous research with elementary students suggests that this is not the case (e.g., Dreher & Sammons, 1994; Kobasigawa, 1983, Wray & Lewis, 1992), future research using a control group is needed.

This study is also limited by the small number of students, particularly at the Title 1 school. Yet despite the small numbers, the results were statistically significant, with respectable effect sizes ranging from .61 to 1.8. Moreover, the pattern of results was the same in two very different types of schools. It is particularly important to note that less able readers at the Title I school were able to benefit from the approach. As Chall, Jacobs, and Baldwin (1990) have argued, it is reading information texts such as science and social studies that has been most difficult for low-income children. Consequently, we believe this study offers

promising results. This study represents an exploration of instructional practices that can be used in more carefully controlled future research. We believe these results help contribute to our understanding of ways to develop independent and motivated researchers who show facility in posing and refining research questions, in locating appropriate resources for answering questions, and in extracting, synthesizing, integrating, and evaluating located information.

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Appendix A

Example Performance Assessment Rubric:

Ratings of Search Logs, Southwestern Plant Version*

Level 1 Search is on irrelevant topic(s)

<u>Example</u>: Student ignores plant topic. Pursues lions in magazine, as well as in a booklet, and a book on animals. Reports picking these resources because he likes lions (one of the first resources he noticed was an attractive magazine on "Big Cats").

Level 2 Search includes appropriate resources but student records only minimal information (e.g., a list of plants or a sentence)

<u>Examples</u>: Student tries several potentially appropriate resources: book on the Navajos, P encyclopedia (for plant), Plants and seeds book. He finds cactus in one, writes down a fact about cactus. Doesn't find anything else to write down.

Level 3 Search includes appropriate resources. Student records a moderate amount of information, mostly characteristics of plant rather than information targeted to why plant what a good choice to use.

<u>Example</u>: Student uses two appropriate resources and records a few facts about corn and a few about cactus. She includes nothing relevant to why the plant is a good choice to use.

Level 4 Search includes appropriate resources. Student records a moderate to extensive amount of information, including information targeted to why plant what a good choice to use.

Example: Student examines three appropriate resources: two posters and one book. From the first resource, she determines which plants the Indians used. She uses the other two resources for information on her chosen plant and why it was valuable for the Indians.

*Parallel version involves an animal the explorers brought to the New World. Space allows only one rubric to be included; others are available on request.

Appendix B

Categories of Advice for a Classmate with a Specific Research Problem

INDEX Response includes index (but not table of contents). May include other suggestions. Example: Student suggests the index and other books in case the first one doesn't have it.

INDEX AND CONTENTS Response includes both index and table of contents. May include other suggestions. Example: Student suggests the index and the table of contents and 'if it isn't in there, find another reference."

CONTENTS Response includes table of contents (but not index). May include other suggestions. Example: Student suggests using the table of contents or getting a shorter book.

SKIM Response suggests skimming. May include other suggestions. Example: Student suggests skimming and then reading the paragraph when he finds good information.

PICTURES Response includes suggestions to find pictures in the book on the topic. Example: Student suggests looking for pictures of mountains and then reading to find the answer.

CHAPTER/SECTION ON TOPIC Response includes suggestion to find the chapter or section on the topic but no specifics on how to do so. Example: Student suggests "look for chapter on mountains," also suggests trying other books and the encyclopedia.

BOOKS Response focuses on books. Example: Student suggests getting book on the mountains of California and advises "don't give up."

READING Response focuses on persevering with the reading. <u>Example</u>: Student suggests starting with short books and reading one paragraph a day until done

ENCYCLOPEDIA Response focuses on encyclopedia. <u>Example</u>: Student suggests using an encyclopedia instead.

DICTIONARY Response focuses on dictionary. <u>Example</u>: Student suggests using a dictionary, as well as thinking in your head and trying your best.

Table 1

Performance Assessment Means (Standard Deviations)

| | School 1 | | School 2 | |
	Fall	Spring	Fall	Spring
Prior knowledge	2.88 (.80)	2.96 (.55)	2.85 (.69)	2.69 (.48)
Search	2.46 (.78)	3.21 (.83)	1.85 (.99)	3.15 (.99)
Answer to Search Task	2.58 (.93)	4.08 (.97)	2.15 (1.21)	3.54 (1.13)
Application	2.71 (.75)	4.29 (.86)	2.54 (.66)	3.69 (.75)

Note. School 1, N= 24 for all other variables. School 2, N=13.

Table 2

Interview: Tips for Other Fourth-Graders

Category	School 1		School 2	
	Fall	Spring	Fall	Spring
Strategy advice	6 (26%)	21 (91%)	3 (27%)	9 (82%)
Resource advice	17 (74%)	1 (4%)	8 (73%)	1 (9%)
General work advice				1 (9%)
Not sure		1 (4%)		

Table 3

Interview: Advice for a Classmate with a Specific Research Problem

Category	School 1		School 2	
	Fall	Spring	Fall	Spring
Index	3 (13%)	5 (22%)		3 (27%)
Index and Contents	4 (17%)	16 (70%)		4 (36%)
Contents	4 (17%)		2 (18%)	3 (27%)
Skim	2 (9%)	1 (4%)	2 (18%)	
Pictures	2 (9%)		1 (9%)	
Chapter/section on topic	2 (9%)		1 (9%)	
Books	3 (13%)		2 (18%)	1 (9%)
Read	1 (4%)		1 (9%)	
Encyclopedia	1 (4%)	1 (4%)	1 (9%)	
Dictionary	1 (4%)		1 (9%)	

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