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Locating Categories and Sources of Information: How Skilled Are New Zealand Children?

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The ability of New Zealand students to locate information using library structures and systems was measured through the standardization of six new Information Skills tests on students (N=5,400) in years 5 through 8. The paper and pencil tests are based on an information problem-solving perspective of the New Zealand Curriculum Framework Essential Skills. The tests focus on a formative exploration of students' understanding of the information skills involved in using library-related resources, specifically libraries, parts of a book, and reference sources. Girls, students in higher socio-economic schools, and students in higher year levels outperform their counterparts, though the literacy level of students is not controlled. The strengths and weaknesses of students are identified for each test. There is strong evidence from all six tests that students experience difficulty with sorting through the various dimensions of a search task in order to select an appropriate category (Dreher and Guthrie 1990), specifically the volume, page, or library section that the required information will be in.

Locating information is considered a relatively easy stage in information problem-solving (Crooks and Flockton, 1998) but it is not necessarily straightforward. Indeed, students often encounter their first real problems in answering their research questions when they try to find the information they need in a library.

To locate information, students must accurately identify the category of information being sought (e.g., the physiology of a bird's wing or its function). This topic-clarification process is

- How do I know which information to trust?
- What does the information mean?
- How does the information I have found address my problem?
- How do I make sense of the information so that I can create a solution for my problem?
- How do I share my solution with others?
- How do I know that my solution is any good?
- How do I know that the processes I used are any good?

These information problem-solving skills are, in the New Zealand Curriculum Framework, an essential skill that has been implemented in such learning areas as English, science, and social studies (Brown 1997, 1999). Figure 1 presents a summary of the various knowledge, attitudes, and abilities that students need to exercise in information problem solving.

Figure 1. Information Literacy Overview

Before	Use pertinent knowledge bases	Develop

The arrow indicates that the various activities interact with each other and that carrying out these activities is not unidirectional. Nevertheless, as mentioned earlier, paper and pencil testing is not well suited to eliciting information about students' abilities to integrate these various dimensions.

During information problem-solving students must locate and evaluate information sources, select and understand the information within sources, analyze and apply information to the stated information problem, and synthesize a novel or creative solution to the stated information problem. Normally these activities are carried out sequentially, as indicated by the one-way arrow, though there will be recursion and revision as new information is brought to light.

After having developed a solution to their information problem, students need to present their answer in some format and undertake metacognitive reflection on their product and processes. This interactive process, as indicated by the two-way arrow, allows students to engage in an evaluation of their strengths and weaknesses, leading to improved learning.

Assessing students' ability to locate sources of information is possible through the use of paper and pencil standardized tests; however, most of the "before" and "after" stages can only be validly assessed through teacher or peer evaluations, by student self-reports or by performance assessment.

Survey Sample

In March 1999 information skills tests were administered to nearly 5,400 randomly selected students. The students were enrolled at schools randomly selected from a geographically and school-size stratified sample. The number of students tested for the primary tests at years 5 and 6 (normally ages 10–11) and at years 7 and 8 (normally ages 12–13) for the intermediate tests is shown in table 1. The numbers are different since each student only completed one test, and so three different sample populations were used for the three test modules.

Table 1. Survey Sample Populations by Level, Year, and Gender

	Primary				Intermediate			
	Year 5		Year 6		Year 7		Year 8	
	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
Finding information in a library	236	243	271	209	252	232	185	232
Finding information in parts of a book	224	250	234	234	220	239	246	231
Finding information in reference sources	117	151	178	181	213	228	261	255

A careful examination of the demographic makeup of these test populations was undertaken. The following school-

(Wu, Adams, and Wilson 1997) and SAS (SAS Institute, 1996) was used for multiple analysis of variance (MANOVA).

The tests are designed to take no more than 30 minutes of testing time and contain between 26 and 34 items each. The tests are largely in constructed response format with multiple-choice

Figure 3. Finding Information in Reference Sources, Primary Level

For questions 13 to 15, write the one *volume number from the encyclopedia set below that best answers the question. Each volume has information about topics beginning with the letters shown.*

13. Which one volume would probably list the sports that have been included in the last three Olympic games? _____

14. Which one volume might have pictures of a Stegosaurus, a Brontosaurus, a Tyrannosaurus, and a Velociraptor? _____

15. Which one volume might have information about the New Zealand woman, Kate Sheppard?

Encyclopedia set

Figure 4. Finding Information in Parts of a Book, Primary Level

Use this table of contents from a book called Mountains *to answer questions 14–20. For questions 14–16, write the chapter number that best answers the question.*

14. Which one chapter would probably have the most information about volcanoes? _____

15. Which one chapter would tell you where some of the world's major glaciers are? _____

16. Which two chapters would have information on people in the mountains? _____ and _____

17. Which of these chapters would tell you how people and other forms of life live on mountains?

(A) 6 and 7
(B) 6, 7, and 8

(C) 8 and 9
(D) 8, 9, and 10

Table of contents

As the figures show, the tests require students to solve information problems typical of the kind of activity they might normally engage in for school purposes. In figure 2, taken from the

consistently, with such consistency accounting for around 74% of all variance on average. The standard errors of measurement are quite small, ranging from 7.4% to 8.3%, with an average of 8.0%.

Year Level

The first statistically significant finding (table 3) is that students at a higher year level are somewhat more able to answer the questions than students at a correspondingly lower one. However, the difference between year levels is often not very large; the effect sizes range from 0.27 to 0.86 with an average of 0.45. Such small difference may occur because there has been little direct teaching and learning going on related to the constructs measured by the tests. In other words, students may learn more about these things incidentally rather than as a result of deliberate instructional programs. However, if the better reading ability of older students plays a significant part in these results, then students may be learning very little at present.

Table 3. Mean Scores by Year

	Primary		Intermediate	
	Year 5 (%)	Year 6 (%)	Year 7 (%)	Year 8 (%)

Gender

The second major statistically significant finding is that girls are consistently somewhat more

Thus, it would appear that as boys and girls progress from year 5 to year 8 the difference in their ability to locate information first increases and then begins to decrease. Interesting as these interactions are, there is insufficient difference between boys and girls to warrant separate norms.

Decile

The socio-economic status (SES) of students has been measured through the proxy of the socio-economic status indicator of the school. In New Zealand, as mentioned earlier, school "decile" indicates SES. Decile indicates the tenth of SES in which the school falls as measured by statistical sampling of the incomes, household crowding, ethnicities, and education of a sample of households within the various geographic areas from which students attending the school come (Ministry of Education 1997). Low SES is associated with deciles 1–3, while high SES is associated with deciles 8–10.

The third major finding is that the mean achievement of students in high decile schools exceeds that of those in low decile schools. The difference between deciles is statistically significant for each test, though there are some interesting anomalies. The increase in mean score by decile does not increase monotonically. Often the mean score of students at a low decile (1–-3) will be as high as those in mid decile (4–7) schools. Just as often the mean score of students in high decile (8–10) schools will be as low as that of students in mid decile schools. Furthermore, the range of scores within each decile is very similar; there are students at every decile who get the lowest and highest possible marks.

This result has strong implications for classroom teachers. No matter the decile of the school, it is possible there will be students who will do very well on these tests while there will be others who will not be able to answer many questions correctly.

It should be noted that all of the demographic and student variables identified explain only 20% to 30% of variance in the test scores. This clearly indicates that student literacy, verbal and scholastic abilities, and other idiosyncratic traits generate the greatest proportion of variance. Further validation studies are needed to isolate the role of these factors.

Achievement by Content

Since these tests are designed to inform teachers as to the learning needs of students rather than just provide comparative norms, a thorough analysis of the content and the kinds of errors made by students was carried out. It is this level of detail about information literacy that is of real interest to teachers, teacher-librarians, and administrators. In other words, on which types of locating information skills do which students need further instruction? Thus, use of these tests allows the identification of the locating skills that students need to develop. Table 6 reports the average level scores for each of the categories discussed in table 2 earlier.

Table 6. Average Percentage of Achievement by Content and Level

Finding Information in a Library	Finding Information in Parts of a Book	Finding Information in Reference Sources
Citation knowledge	Alphabetic order knowledge	Dictionary usage
Primary = 56%	*Primary = 62%*	*Primary = 44%*
Intermediate = 74%	*Intermediate = 59%*	*Intermediate = 44%*
Discrimination between fiction and nonfiction categories	Book parts (including title page, glossary, appendix, etc.) knowledge	Directory usage (including TV schedule, white and yellow pages, etc.)
Primary = 40%	*Primary = 51%*	*Primary = 75%*
Intermediate = 24%	*Intermediate = 54%*	*Intermediate = 71%*
Keyword, subject, or topic identification	Index usage	Encyclopedia usage
Primary = 22%	*Primary 44%*	*Primary = 55%*
Intermediate = 64%	*Intermediate = 55%*	*Intermediate = 44%*
Location of items on shelves	Table of contents usage	Reference source usage
Primary = 57%	*Primary = 44%*	*Primary = 55%*
Intermediate = 47%	*Intermediate = 46%*	*Intermediate = 64%*
Search procedures		
Primary 43%		
Intermediate = 53%		
Source selection		
Primary = 43%		
Intermediate = 47%		
Understanding and use of Dewey decimal system		
Primary = 53%		

The difficulty of the questions was determined from the item logits derived from the ConQuest item analysis, which is based on the Rasch single-parameter model. Detailed discussion of the findings relevant to the six tests is reserved for the easiest and most difficult sections only as determined by the average logit values of the questions. The following narrative discusses the hardest and easiest sections of each test at each level as well as the category selection problem common to all tests. It is worth remembering at this point that the information skill being reported is the locating skill only.

Library

Primary

Identifying the title of a book and locating fiction and nonfiction items on the shelves were the two easiest skills for primary age students, with about 50% of year 5 students answering the 8 items correctly and between 65 and 75% of year 6 students answering correctly.

The wrong answers provide some insight into what students find difficult in this easiest area of library information skills.

- Approximately 25% believed that the subject keywords, rather than the Dewey decimal number, would help them find books in the nonfiction section.
- Approximately 20% chose to use the publisher's name, rather than the Dewey decimal number, to locate books in the nonfiction section.
- Approximately 11% believed the Dewey decimal number referred to the number of pages in the book.
- Approximately 15% of students identified the author as the title from a catalog display.

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Intermediate

At the intermediate level, students found identifying the complete range of bibliographic citation information relatively easy (at an average of 69% correct at year 7 and 78% correct at year 8 on 7 items). Identifying and creating keyword search terms was next easiest (at an average of 58% correct at year 7 and 70% correct at year 8 on 4 items). Students found accurately identifying the publication year, place, and publisher the hardest part of this skill, with the proportion of students making this type of error ranging from 5% to 11%.

Selecting sources that are not books was relatively hard (at an average of 41% correct at year 7 and 52% correct at year 8 on 3 items). Discriminating between fiction and nonfiction categories was still the hardest library information skill (at an average of 20% correct at year 7 and 27% at year 8 on 3 items). Approximately half of all students selected a book-format item when a nonbook was required. And again, 25% of students reversed the meaning of the words “fiction” and “nonfiction,” while 15% looked in the reference section for nonfiction items.

Parts of a Book

Results are reported by ease or difficulty rather than by level since students performed in such a similar manner.

Easy

At both primary and intermediate levels, students found the alphabetic order questions easiest (at an average of 58% correct at year 5, 66% correct at year 6, 55% correct at year 7, and 63% correct at year 8 based on 6 items in each test). Mistakes were most often made with the last or penultimate words when putting lists of 4 or 5 words into alphabetic order (11% and 12.5% accuracy rate of students for primary and intermediate tests respectively).

Hard

The primary students found the index section most difficult (at an average of 39% correct at year 5 and 49% correct at year 6 on 7 items). The intermediate students found the 7 items on the table of contents most difficult (at an average of 43% correct at year 7 and 49% correct at year 8). It is interesting to note that in both topic areas the information skill is similar: category selection. Both sections require students to integrate several factors into the creation of a search strategy resulting in a selection of an appropriate category. Approximately 33% of primary students and 20% of intermediate students responded in a way that showed they had not kept in mind all the task criteria when answering.

By way of illustration, students were provided with a table of contents and asked to identify the page on which information would be found about Lake Wakatipu, a water-filled glacier valley. Intermediate students who got this question wrong might have been distracted by six different contents pages: “the valley stream,” “glaciers,” “lakes and swamps,” “river-made lakes,” “blocked-valley lakes,” or “lakes fresh and salty.” Selection of any of these choices indicates that

Reference Sources

Results are reported by ease or difficulty rather than by level since students performed in such a similar manner.

Easy

At both primary and intermediate levels, students found the directory questions easiest (at an average of 72% correct year 5, 77% correct year 6, 68% correct year 7, and 74% correct year 8 based on 5 items in each test). Again, both sections require students to integrate several factors into the creation of a search strategy that results in a selection of an appropriate category. Approximately 40% of primary students and between 20% and 33% of intermediate students responded using only one key term or ignoring the key restrictive terms such as “only” or “after.”

Hard

At both levels, students found the dictionary section hardest (at an average of 43% correct year 5, 40% correct year 6, 44% correct year 7, and 41% correct year 8 based on 6 and 7 items, respectively). The choice of the last word on the page as the second guide word posed the most challenge for students. Approximately 40% of primary students and 33% of intermediate students chose the top word of the right hand column of a dictionary page as the last word on a page guide, instead of the last word in the right hand column.

Category Selection

Category selection (Dreher and Guthrie 1990) has been apparent in all six tests. Samples of this can be seen in figures 3 and 4. The task to select the correct volume of an encyclopedia for the Olympic Games requires deciding on the key search term: “olympic” or “games.” The task of identifying the volume of an encyclopedia with information on dinosaurs from a list of examples requires the students to generate the organizing category. Fortunately dinosaur is both a word and concept in the vocabularies and minds of many young people in western society, and so this task of generating the appropriate search category from a list of examples is realistic and valid. On the other hand, selecting the volume that has information on the New Zealand woman Kate Sheppard requires selection from multiple search terms, such as, “New Zealand,” “woman,” “Kate,” and “Sheppard.” Only those students who have mastered the convention that a person’s surname is used as the key search term were capable of generating the most appropriate answer. Only if such a search provided no answer would a search by a more general category be justified.

The pattern of results when averaged across the tests is informative. At the primary level about 50% of students are capable of selecting the correct category when working with one key search term. When two or more key search terms are provided, only 33% of students are capable of selecting the correct category. In the latter condition another 33% of students select a category that meets the requirements of one of the search terms that is not the key or central term in the search task.

At the intermediate level, 60% of students are able to correctly select a category when working with one key search term. Nearly 50% of them are also able to correctly select the correct

category when working with more than one search requirement, while only 25% of them select a category using a minor search term.

Plainly there is growth in students'

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