CHILDREN AS INFORMATION SEEKERS: THE COGNITIVE DEMANDS OF TOPIC WORK, BOOKS AND LIBRARY SYSTEMS

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Penelope Anne Moore
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ABSTRACT

The problems associated with retrieving information are becoming more evident to library professionals and teachers as knowledge continues to grow exponentially. However, children are frequently expected to use library resources independently, yet little is known of the cognitive demands imposed upon them by research tasks, books and library systems. Here 23 Form 1 children shared their thinking processes as they endeavoured to generate questions and find information for topic work. Video recordings of think aloud/concurrent interviews, and subsequent audio recording of retrospective interviews, were used to gain a child's view of the problems involved in such assignments.

It was found that the children's limited knowledge base resulted in formulation of general, frequently vague, questions. These made the choice of search terms compatible with the demands of indexing systems rather difficult. The children understood the Dewey Decimal system in terms of locating a broad subject area but the distinctions made possible by the use of decimal points were understood by only 1 child.

The children's theoretical understanding of the Dewey system could not always be put into practise because of a lack of understanding about the relationship between catalogue index cards and the actual books on the shelves, together with confusions caused by the manner in which books are shelved. Only 3 children showed clear evidence that they knew that the library shelving consisted of adjacent bays rather than shelves which ran continuously around the room. 15 children located books relevant to the topic BIRDS.

Most children relied on cover information to determine which books should be examined more closely. 7 of them sought a title which contained the exact word they had chosen as a search term. While only 1 child failed to use the table of contents or indexes in books, the children found relevant information during the interviews to answer only 30 of the 86 questions generated. Completed projects included answers to only 48% of the questions

originally posed by the children together with questions substituted to fit the information found. This appeared to be a function of the questions themselves, the search terms chosen and whether the table of contents or index was examined. Further, several books were found to lack both (or either) contents or indexes and some had no page numbers, thus making information location extremely difficult.

The management of a task as complex as information seeking demands knowledge of the information retrieval process itself and a range of appropriate cognitive and metacognitive strategies to allow the searcher to monitor and regulate strategy application in terms of information seeking and the demands of the information resources to hand. Given the barriers to information location inherent in both the books and the library system as viewed by these children, it appears that students need to approach information seeking with a problem-solving orientation.

Several levels of assistance are required by Form 1 students engaged in topic work. Blanket assessment of the end product of such assignments ignores much of the learning potential inherent in the task. The implications of these findings for the teaching of information and thinking skills are discussed.

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INTRODUCTION

> "At the rate at which knowledge is growing, by the time the child born today graduates from college, the amount of knowledge in the world will be four times as great. By the time the same child is fifty years old it will be 32 times as great, and 97% of everything known in the world will have been learned since the time he was born." (Hilliard, 1971)

Many writers have documented the incredible rate at which knowledge is increasing. In Britain alone there are about 500 new books published every week and in the realm of physics for instance, the literature doubles in size every six years (Irving, 1985). In addition, electronic and audio visual materials abound and they too add to the information available on most subjects. This exponential growth of knowledge presents challenges at all levels of society. In particular, library and other information workers are becoming more and more aware of the difficulties of retrieving information on any given topic. However, evaluation of retrieval systems has sometimes been restricted to counting the number of documents retrieved and has not considered the usefulness of these to the client. There is growing awareness that evaluation of retrieval systems must include factors such as the user's satisfaction and final use of the information gained (e.g Beal, 1980; Lancaster, 1986).

Beal (1980) espouses the view that the user's information search strategy should also be considered in evaluating the effectiveness of retrieval systems and their associated indexes. The problems of indexing and using indexes are central to the use of information sources. However, Beal points out that most studies of information user's needs do not address these points. Further, the majority of such studies focus on the information needs of adults. The problems besetting children in the same

situation are largely unknown. Library professionals have begun to investigate some of the issues surrounding information use and the emerging picture suggests that greater attention to teaching information skills is necessary at all levels of education (Rudduck and Hopkins, 1984; Beal, 1980).

Within teaching, the so-called information explosion has created a situation in which it is impossible to predict the knowledge areas necessary to future social and economic survival. However, it is abundantly clear that people will need the skills to handle information both as creators of new information and recipients of that previously generated (Irving, 1985). Further, various reports point to the rising importance of general education with an emphasis on skills such as problem finding and problem solution (Beswick, 1977). It is the view of Liesener (1985) that the challenge to teach higher order cognitive and problem-solving skills more effectively cannot be responded to successfully with a naive view of information use and users.

Teaching methods based on discovery principles are prevalent throughout primary and secondary education and it is often assumed that by the age of 11 years children will have mastered some of the skills necessary to independent completion of assignments demanding information seeking and use. These are variously called topic work, projects, resource-based learning etc, etc. The following discussion will use the term "topic work" to encompass the various labels given to discovery based learning.

Avann (1985) suggests that at its best, topic work provides children with opportunities to acquire and practise the skills of gathering and evaluating information from a variety of sources. It can also lead to critical use of resource materials and greater skills in reading and writing. In addition, it is often claimed to foster independent learning and to enable the student to control and be involved in his or her own learning with the teacher facillitating, rather than adopting an active teaching role (Garner, 1986). However, Gagne (1977) points out that some

teachers misinterpret the theory by assuming that such work is to be carried out with the minimum of guidance. Rather, topic work requires teachers to do much advance planning to ensure that the task is tailored to the available resources and the children's abilities (Callison, 1986).

Avann has noted a feeling of disappointment among teachers viewing the results of topic work since much of it seems to be little more than copying uncritically from books. She suggests that the problem may centre on the fact that the product of topic work has been treated as more important than the process by which the information is obtained. To overcome this, she suggests that topic work be undertaken with the idea that the skills it will develop are at least as important as the subject chosen for study. To some extent it has been previously assumed that these higher level skills will simply emerge as a by-product of education and development and that therefore there is no need to address them directly (Sheingold, 1987). However, close examination of the task given to children, issues of information retrieval, and the skills the children bring to the situation, reveals that this assumption is unrealistic in the extreme. The interaction of these factors is highly complex and yet to be researched in detail. What follows is an attempt to outline the interaction and provide a context for observing children's attempts to find the information necessary to completion of a typical project.

The Task

Usually, students are given a topic to investigate (generally this is a person, place or event). They are told to go to the library, find some sources and take notes, then to make an outline and write a report (Sheingold, 1987). In Sheingold's opinion this does not involve inquiry learning since the topic is likely to be a category (e.g. Switzerland, Ancient Egypt) rather than a problem or question. Information seeking is driven by the need to answer questions or solve problems and the goals for

category type assignments are not likely to be the teacher's intentional learning goals but rather, are practical ones such as review the right number of resources, write a given number of pages and make an attractive cover. At the very least Sheingold holds that information seeking should be motivated by questions whose purpose, meaning or relation to the real world is apparent to the child (Sheingold, 1987).

Irving (1985) endorses this comment in noting that it is difficult for new knowledge to be absorbed into and linked with existing knowledge if its purpose is unclear or unknown. Further, she calls for assessment criteria of such assignments to be made explicit to the students as these significantly influence the learning strategies they will select for the task. She states that assessments rarely test skills or processes, yet to many educators, it is the skills and processes underlying topic work which are the key to independent and continued learning across the curriculum (Avann, 1985; Irving, 1985; Liesener, 1985). The level of sophistication of study skills varies with the complexity of the given assignment and may be hidden from both the teacher and the pupil until assessment takes place (e.g. "Where are the references?").

Further, it seems to be assumed that children beginning topic work will spontaneously use their existing knowledge to direct information searching, that generating questions on a little known subject is easy and that the relevant information can be sorted from irrelevant with no difficulty. However, Miyake and Norman (1979) found that adult experts on a given subject are able to generate significantly more questions than are novices and since topics are usually chosen to increase children's knowledge, they are unlikely to be experts in the field. In addition, the questions formulated must be in terms compatible with the library retrieval system. A small study by Moore (1988) indicated that 9 and 10 year olds have difficulty suggesting subject words that are compatible with the Dewey decimal system and may only suggest alternative words when prompted. These children were often unaware of the significance

of their existing knowledge to the task of directing an information search and 70% of the subject words they selected would access no relevant information from the library system.

Having come up with a question and located the appropriate resources (a problematic task in itself) children are faced with a complex reading task. In the classroom, they are likely to be given reading materials that match their reading abilities. In the library or at home they may be confronted by texts which are much more difficult. Again, in the classroom, reading is usually in short bursts of about 15 seconds - read the instruction and start work - in topic work substantial pieces of text must be reflected upon (Lunzer and Gardner, 1979).

In a discussion of higher order thinking skills, Resnick (1986) points out that well written texts are, by their nature, incomplete expressions of the author's mental representation of events. The reader, in reading for learning, must impose meaning by activating four kinds of knowledge. The first is linguistic and concerns knowledge of how sentences are formed, rules of backwards and forwards reference and other knowledge needed to construct a coherent set of events and relationships. Knowledge of the subject matter of the text is also needed, as is knowledge of rules of inference. In addition, knowledge of conventional rhetorical structures helps interpretation of text. In other words, the reader uses a combination of what is written, what is already known and general processes such as inferring, checking and organising, to construct a plausible representation of what the author had in mind. Lunzer and Gardner (1979) suggest that reading for learning demands that the reader carry on a conversation with the text - continually asking questions, finding answers and commenting. Indeed, it has been found that training in self-monitoring skills of this kind can result in durable improvements of reading comprehension with definite transfer of the skills to tasks other than that used for training (Palincsar and Brown, 1984). Lunzer and Gardner did find, however, that reading for learning (a goal of topic work) does not figure prominently in students' minds in the early secondary

school years (equivalent to Intermediate school in New Zealand).

Consideration of the abilities of primary school age children in relation to the above suggests that the cognitive demands of topic work can be high. This is not to imply, however, that it should be limited to the upper levels of schooling. According to Resnick (1986), "The single most important message of modern research on the nature of thinking is that the kinds of activities traditionally associated with [higher level] thinking are not limited to advanced levels of development. Instead they are an intimate part of even elementary levels of reading, mathematics and other branches of learning..." (p10). Thus topic work could be seen to provide a context for both studying and developing sophisticated thinking skills and abilities to handle information whilst at the same time increasing the student's world knowledge.

Having indicated that tasks set as topic work carry with them a degree of cognitive difficulty that is often unrecognised by adults, let us now turn to the task of information retrieval.

Information Retrieval

School libraries are the major, and sometimes only, source of information that children refer to when faced by assignments demanding information gathering. Although professional librarians are rarely employed at primary and intermediate levels, school library collections are likely to be organised according to an accepted library classification system, e.g. Dewey decimal. Thus the librarian's view of the world of knowledge and its structure and the teacher's view of the intended area of study come face to face in the children's interpretation of the information needs. For some teachers, the effectiveness of the library's retrieval system in meeting these needs and the way that system forces children to conceptualize them, are matters for concern (Beswick, 1977). Given that school librarians have rarely been actively involved in curriculum development, research or innovative educational activities and

that they are sometimes quite naive in their description of information use, the possibility of conflict between these two views of what is relevant to the children's study is quite real. Thus it would seem that a dialogue between teachers, librarians and other media specialists would be of value. Beswick, (1983) believes that genuine discussion between these groups has only recently become possible and its full benefits are still to be realised.

Several levels of constraints to information retrieval exist. Here attention will focus on factors relating to information retrieval from individual books within school library settings and the research process as it relates to children's information needs.

Individual Books

Given that indexing is central to finding information (Beal, 1980), it is worthwhile to consider the quality of indexes in children's books. Miller (1980) examined children's books in Australia and found that reference books in school libraries often lack what she would consider to be good indexes. Where there is no index, a child is forced to skim countless pages to find information and her feeling is that "most children do not possess this skill" and many of them read more slowly than literate adults realise. In addition, some books also lack a contents page, thus there is no way to retrieve information except by reading the entire volume. In her opinion, where indexes are provided in children's books, they are of low standard with frequent omissions and mistakes. Her most depressing finding was the ease with which defects could be found in the indexes! Miller suspects that many index compilers have no training in indexing nor much knowledge of the subject matter of the books they index. (Authors are not usually expected to provide index materials). The ideal indexing situation is one in which the indexer has knowledge of the subject matter and the age group for whom the book is designed. In addition the index

should supplement the contents page and should contain terms that are appropriate to the information user's likely approaches. To quote Miller (1980), "I cannot stress too strongly that for many children, using an index is a laborious task, and the index should therefore be made both as simple and yet as comprehensive as possible."

The above, of course assumes that children will seek the index as a retrieval aid. Moore (1988) suggested that although children may be able to talk about indexes, they may not use them spontaneously to aid information retrieval.

Marland (1978) lists three functions of individual book indexes which should be taught in schools. The first is that they reveal the scope, level and detail of a book and thus its suitability for the reader's purpose. The second is that the index "unorganizes" the author's organisation of the subject and allows the reader to reorganize it and finally, that the index is a recall device. Writing more generally, Avann (1985) says that we should demonstrate to children that "information books" are (or should be) organized for information retrieval, with contents pages, indexes and bibliographies, together with clues such as publication dates, to help in the assessment of their usefulness as information sources. Marland adds that teaching reading is not enough. Reading must be complemented with an ability to analyze and re-organize printed information, thus equipping children to use books as learning resources. Use of this skill demonstrates understanding and Irving (1985) holds that if students were given opportunities to devise knowledge structures and orders for themselves, many more would perhaps be able to show their true ability. The asumption is that the knowledge structures they devise would be recognised as reflections of their preferred learning structures and styles. However in topic work, Irving points out that failure by the student to match the teacher's preferred information structure may be taken as lack of understanding.

A further information retrieval constraint at the individual book level must be the reader's ability to comprehend and quickly

sift the text for relevant information. The reader's knowledge of the purpose of chapter and sub-headings and the structure of paragraphs influences the reading strategies that can be brought into play and the length of time available for the exercise must influence children's success in this area.

School Libraries

Turning to consideration of the total library system compounds the problems implied above. Beal (1980) states that the very nature of indexing systems tends to solidify the information worker's view of the world and systems are sometimes accepted as unproblematic for the user. The success of the library catalogue as a retrieval aid depends upon several factors. The language of indexes and catalogues exists primarily to bring the vocabulary of the indexer and the vocabulary of the searcher in line with each other (Lancaster, 1972). Thus the appropriateness of the catalogue and its coverage, its ability to describe the contents of the books, together with its accuracy and quality will all influence the success of information searches. The information explosion has stretched the Dewey and other classification systems to the full and Beswick (1977) says they are "in an appalling muddle". Thus the adequacy of library catatalogues generally is called into question.

On the user's side of the equation is ability to describe the information needed - hazy conceptualization of the topic makes the choice of index search terms extremely difficult (Beal, 1980). The quality of the user's search strategy likewise influences search outcomes. It has been shown in a study at Loughborough University that the majority of tertiary students are unaccustomed to thinking of their information needs in the terms used by the indexes, and they do not consider the word combinations that best match their needs (Beal 1980). Yet these are skills that are expected of primary and secondary school children engaged in topic work. As previously mentioned, Moore (1988) found that 70% of the words 9 and 10 year olds selected to

represent subjects would not access any relevant information from the Dewey decimal system. In addition, children seemed bound to the subject word they chose to the point that even having found no entry in the index, they would still seek that word in the title of books on the shelf. Beswick (1977) points out that failure to find answers to information needs may be disastrous to the development of a pupil's confidence and interest in further study. There must be sufficient expectation and experience of success to spur the child to further effort.

Hatt (1976, cited by Beal, 1980) suggests that many of the difficulties library users experience are due to the fact that they are trying to find materials for the first time by using a system designed to locate them when their existence and classification is already known. In dividing up a field of knowledge for indexing purposes, a category or term has to be defined with reference to other categories found in that field. In searching for an item of knowledge, the user (particularly when young and inexperienced) may not have any clear idea of the field or its structure. It seems a little unrealistic to expect youthful information searchers to make conscious and explicit the organising and distinguishing activities that are taken for granted by professional indexers and teachers. In other words, what may appear to be a clear and simple research topic from the adult's viewpoint may be ill-defined and difficult when viewed from the student's knowledge base.

Beal (1980) notes that little is known about the degree to which children conceive the organisation of material in a library as a static representation of bodies of knowledge. She suggests that unless children come to see indexes and classification systems as represention of certain views about the organisation of bodies of knowledge, they will be seriously hampered in acquiring a flexible approach to information and the tools used to access it. They need an awareness that there may be several paths through the index to any one item of information.

Turning now to the actual index cards, few data are available on children's response to the information on these. Moore's 1988 study was too small to allow generalisation to any

degree, but the findings suggest understanding of index cards cannot be assumed. Failure to find a chosen subject word was interpreted by at least one child as evidence that the library did not have a book on the subject. Some other children seemed not to realise the nature of the relationship between the index cards and the books on the shelf. Although basic Dewey numbers were understood, there was uncertainty about the meaning of digits beyond the decimal point and cards giving two different numbers caused confusion.

In addition to these cognitive issues, the typical school library presents some physically based hazards. Books are often shelved and mis-shelved by the children themselves. The shelving system may follow the standard library procedure of using shelving bays which are about a metre in width. These are usually placed side by side. Children may well see a set of continuous shelves and expect the books to be placed on them accordingly. Shelving bay by bay may then cause confusion when consecutive Dewey numbers are sought. In short, by failing to examine library tasks from the children's viewpoint, adults may be blind to a number of hindrances to children's information seeking, many of which may be easily remedied.

We turn next to the skills needed to carry out library research.

Library and Study Skills - The Research Process

Thus far this account seems to imply that children are often merely set adrift in a sea of information and left to fend for themselves. To the contrary, teachers and librarians have endeavoured to develop library and study skills in their young charges for many decades. Research studies examining the effectiveness of past efforts are few in number because of the design and methodological difficulties. Consequently little is known of the learning demands imposed by various kinds of assignments or the tactics students employ in completing them. Most of the available literature springs from studies of the

research problems and processes of students in higher education. It is only recently that similar issues have been identified in schools and hence the focus of attention is gradually widening to include younger students (Irving, 1985).

Irving summarizes a hundred years or so of library-based instruction, pointing out that lessons have generally been divorced from the rest of the curriculum and the children's information needs. Where the curriculum has been taken into account, library skills exercises have often been quiz-based, relying on "aimless trots through the catalogue and reference books by pupils carrying work cards which set them questions, the answers to which nobody but a desperate teacher-librarian would ever think to ask" (Beswick, 1977, cited by Irving, 1985).

The shortcomings of this approach are illustrated by one of the few studies to pay attention to how children seek information. It was found that searching often appeared to be a random sampling of books from the shelves rather than purposeful enquiry. Although the children concerned could state how to find an appropriate book, they appeared reluctant to put this theory into practice (Lunzer and Gardner, 1979). Part of the problem, according to Irving, is that library skills instruction often lacks relevance to academic needs and does not emphasize the skills requisite to using information. Further, she criticises the use of terms such as 'library' and 'study' skills in that lists of these produced in the past frequently omit all reference to actually thinking. Rather, she uses the term 'information skills'. This in itself is poorly defined in the literature but she claims it is important to use a broad term which "represents the totality of human processes which are still being understood and discovered". Information processing is at the heart of much daily activity for most people and it is arguable that the same skills are relevant to all subjects. What differs is the level to which they need to be developed for any given subject and, developmentally, the level of sophistication rather than the extent of their use (Irving, 1985).

The information skills lists so far produced vary in format

yet agree in essence that the following abilities are important:

1 identifying a need for information and being able to articulate that need
2 framing appropriate questions
3 finding information sources
4 evaluating those sources
5 extracting relevant information
6 processing and if necessary presenting the information to others. (Avann, 1985)

Many lists include, in addition, evaluation of what has been learned and indicate the form in which items can be introduced at all levels of schooling (e.g. Avann, 1985; Garner, 1986; Walisser, 1985 and Gawith, 1988). Such approaches to teaching information handling skills are much more process oriented than were the old library and study skills programmes but, Irving (1985) points out, many skills and curriculum guides that treat information skills in detail, do so from the teacher's view of knowledge and skills rather than from the child's view. She states that this is a significant difference, the subtlety of which is rarely grasped. For example, a further level of complexity is added when one considers that the children must also monitor their level of growing knowledge on the topic in order to evaluate the sources they do find. The library research process is one that involves much reiteration and re-evaluation. For instance, the notion of relevance is one which constantly shifts relative to the information already found on a topic (Beal, 1980).

In many ways the library research process is akin to complex problem solving and demands planning, regulating and tracking abilities. This implies a role for higher order thinking or metacognitive skills. These skills and their relationship with information seeking deserve research attention and indeed a model of metacognition and learning variables has provided the means by which the elements in this complex discussion have been ordered to allow examination (Brown, Bransford, Ferrara and Campione, 1983). In the context of outlining the present study, this

model will be made explicit and children's actual responses to the many and varied demands presented above will be illustrated with reference to (among others) Nicholson's (1988) report on reading and learning in the junior secondary school.

Irving (1985) is one of a growing information skills lobby group which calls, not for new subjects or skills to be taught, but for new thinking and strategies for teaching and learning to be incorporated into the existing practices of all teachers. This is in total harmony with Beeby's plea that "new ways of teaching, learning and understanding be found if the new generation is not to be intellectually smothered beneath a mountain of facts" (cited by Beswick, 1977). However, one cannot assume that the teachers have such strategies and approaches to thinking already at their disposal. It is unlikely that their education and training explicitly included them (Avann, 1985). This same lobby sees the role of teacher-librarians as that of teachers whose subject is learning to learn (Gawith, 1986).

To be more explicit, Garner (1986) states that for students to develop as independent learners, they need to be taught the steps of the inquiry process and to understand its underlying structure. This is at the very heart of topic work and each stage of the process demands analysis and evaluation by the student to determine how the work is progressing. For the teacher such evaluations can offer insight into pupil performance, misconceptions, the need for help and can reduce prolonged application or poor application of strategies (Irving, 1985). In turn, this implies that both student and teacher will engage in metacognitive skills (Liesener, 1985; Resnick, 1986).

In discussing information retrieval, one must continually consider the searcher's cognitive ability. Therefore it is appropriate to turn now to the characteristics of the learner and what is known of children's information seeking skills.

Children as Information Seekers

Marland (1978) presents the view that it appears to have

been assumed that repeated exercises in topic work will somehow equip the child to approach a study of a subject independently, although no instruction in the techniques of such a process may have been given. In light of this it is not surprising that only in recent years has research attention begun to focus on the issues of children as information seekers and users. Some studies have had evaluation of the library system as their goal and have recorded the number and types of books taken out but few seem to have investigated children's information needs or their processes of information selection in the complex environment of the library. Methodological difficulties have contributed to this lack of research data but there is evidence that the adoption of phenomenological strategies is beginning to be recognised as offering more explanatory value than traditional survey methods (Streatfield, 1983). In one such study, 210 eight year olds were observed in a library during films, story hours, question and answer sessions and games, as well as during their use of books (Wohl, 1984). The conclusions focus largely on the ideal physical setting of the library. Wohl states that the genre of the book (fairytale, adventure etc) must be clearly displayed on the spine of the volume since this is the major criterion by which the children selected fictional reading materials.

With respect to non-fiction searching, an in-depth study of sixth form students' ability to manage independent study and learning found that although some students used the card catalogues and microfiche, most merely looked along the shelves (Rudduck and Hopkins, 1984). Further, it was found that the students felt formal induction lessons exposing the mysteries of the library were too fast and too far in the past to be of much use. This bears out Irving's (1985) comment that library instruction tends to be too brief and is divorced from the curriculum and the students' information needs. Information needs do not exist in isolation of purposes for which information is gathered, thus attention must be given to the goals of information use.

Information workers hold that problem solving is a critical component of successful library searching, yet Tuckett and Stoffle (1984) cite evidence that fully 50% of college freshmen were not reasoning on a level that facilitates essential analytical problem solving skills. One element of this problem solving is to match search terms with those of the index but as previously mentioned, it has been found that university students were unaccustomed to thinking of their information needs in this way (Beal, 1980).

If this picture is a true reflection of the abilities of those at the higher end of the educational scale, what then do the younger children make of the information seeking task?

British teachers' own perceptions and some research studies suggest that children of 10 leave primary school without the ability to find and evaluate information (Avann, 1985). Looking at even younger children, Davies reports on her attempts to get 6 and 7 year olds to find information. She presented them with a collection of books and the instruction to find out something about houses. "They rather hopelessly leafed through the books but they didn't have the first idea of how to begin and didn't find out much at all". Even when Davies gave them question sheets to focus their attention on specific areas, the results were not much better (Davies, in Avann, 1985).

With respect to older children, there is evidence that 11 and 12 year olds may fail to use basic knowledge of retrieval aids, although they are able to state the purpose of the catalogue and wall-charts etc. In a study of children's approaches to topic work Cole and Gardner (1979) found that once a likely information source has been located, the use of contents tables, indexes or chapter headings amongst this age group is not widespread. In scanning books, many children were easily distracted from the purpose of their search and reference books were often treated as "treasure troves of sentences which could be stolen and marketed again in another setting" (Lunzer and Gardner, 1979). Cole and Gardner also noted that the first book which contained something that could be used was accepted

uncritically. Most children observed used only 5 of the 26 books available on the topic "Ancient Egypt" and since they were answering teacher-set questions, copying text was actually the simplest and most efficient way of meeting the task demands.

The authors are quick to point out that despite the inefficient study methods being used, the children were enjoying their work and learned a considerable amount. However, their interest and enthusiasm for topic work did not lead to a willingness to reflect upon what was being read in this case. Cole and Gardner suggest that if learning to learn is the goal of the exercise, the topic selected should be close to the children's own experience to enable them to formulate their own questions more easily. The issue of knowing what there is to know about and being able to formulate questions and hypotheses in order to find out is, according to Irving (1985), central to information skills.

Choosing a topic, or narrowing down one of the teacher's choosing, is perhaps the most sophisticated skill implied in topic work. It involves thinking skills related to an unknown field of study and an ability to discover a structure for that subject. When the choice of topic is left to the pupil, he or she needs guidance in breaking it down into managable portions. Such help is nearly always given to and needed by Phd students but may not be given to school pupils! (Irving, 1985). It seems to be assumed that question formulation is relatively easy for children yet a study of questioning and answering skills by Robinson and Rackshaw (1977) found that 9 year olds were very poor in generating questions with more than 20% of them unable to independently produce questions that went beyond the information provided by the researchers.

Project INQUIRE (a full scale investigation into the development of inquiry skills among American children) found that children rarely use their own questions to guide intellectual activity. When first asked to generate questions about a problem, 11 year olds had difficulty grasping the task. However, once they understood that question generation was both required

and legitimate, they did it with ease (Sheingold, 1987). Whether the investigators addressed the problem of accessing information on the basis of these questions is not reported. It is the matching of the initial questions, index terms and end use of the information that may well present problems. Indeed, Sheingold cites a study of children's note-taking in which it was found that the information collected and recorded by children did not bear on the problem they were asked to solve nor were the solutions they offered at all related to the notes they had taken! In general, the children failed to plan, coordinate and monitor their work. These are high level strategies, the use of which depends on availability of goal-specific strategies aimed at wresting information from individual books. Thus the availability of information retrieval strategies must be examined.

Retrieval Strategies

Kobasigawa (1983) examined in detail the retrieval strategies typically required for conducting research projects in elementary school. His study did not examine location of relevant materials in the library but provided one volume and focused more closely on the children's information retrieval from this. He says that two inter-related subprocesses are involved. Firstly, children must attempt to decide where the desired information is likely to be located. Next, material must be evaluated in terms of relevancy and sufficiency. If the retrieval questions contain explicit keywords to be looked up in the table of contents of a given volume, the search process is relatively straightforward. However, when the questions do not explicitly indicate which chapters of the book are relevant, the process is much more difficult. Information given in the task instructions and questions must be integrated with general knowledge and reasoning skills in order to decide where to look yet the small study by Moore (1988) suggests that children may not spontaneously activate their general knowledge for this

purpose.

The children in Kobasigawa's study (20 nine year olds and 20 thirteen year olds) were given simple information about China then asked what sorts of project questions they would undertake. Half of the younger children did not generate any questions (thus again demonstrating the difficulty of question formulation) but all of the older children did. Fifteen of these latter students responded with open-ended questions.

When given an open-ended question to research, it was found that thirteen year olds were better able to narrow the search area with fewer directive instructions than were needed by the nine year olds. The younger children appeared to have the knowledge relevant to this task but used it only in highly structured situations.

A later study by Kobasigawa, Lacasse and MacDonald (1988) narrowed the research focus to children's ability to use headings and sub-headings for finding a specific piece of factual information in written material. This task requires the use of knowledge about facts and concepts, structural features of written material, the nature of the information sought (e.g. whether it is numerical or contains a specific word) and procedural knowledge including various strategies. Age-related differences in the spontaneous use of text search strategies are likely to appear between the ages of 9 and 13 years. These researchers found that by age 13, 75% of students used headings spontaneously. In addition, Kobasigawa et al note that nine year old students who failed to use headings unprompted, located the sought information more quickly after brief instruction on how to use the headings in this context. However, when keywords in questions and the text do not match, even 15 year olds do not use the available headings to locate target information efficiently (Hartley and Trueman, cited by Kobasigawa et al, 1988).

The effective use of headings for text search demands that children comprehend the search questions and define the information needed, keep in mind what they are seeking during the search and evaluate the answer in terms of the task set. To

explore this latter point Kobasigawa (1983) required students to judge the adequacy of a report apparently written by a child. Older children (13 years) were more adept at recognizing that some information had been omitted but inclusion of irrelevant material did not seem of importance to either age group. Again the question arises of defining what is relevant to a field of study when one is a new comer to that subject.

Turning to this same problem within actual texts, Nicholson (1988) found that texts often assumed readers would know which details were important yet the 13 and 14 years old in his study did not know. In fact, the reading tasks routinely undertaken in the classroom were shown to be more complex than many people usually assume. This is also true of selecting and locating information in general. Heather (1984) examined some of the student difficulties in using dictionaries, indexes and encyclopaedias. She found that ten year olds often had difficulty using the guide words at the top of dictionary pages, many did not understand the difference between index and contents pages and indexes with subheadings were found to be overwhelming. All this suggests that assumptions about children's information skills need to be challenged.

SUMMARY

The foregoing is an attempt to paint a broad, if complex, picture of some of the hazards inherent in information seeking. The importance of fostering information skills was illustrated with reference to the fact that educators can no longer expect to impart to students, during the span of formal education, sufficient knowledge for economic and social survival.

It is sometimes assumed that by the age of 11 years children will have mastered some of the skills necessary to independent completion of assignments demanding information seeking and use, and consequently such assignments are frequently a feature of education at primary and secondary school. However, analysis of the overall task demands, those of the information

retrieval process and a review of the little that is known about children as information seekers, suggests that adult expectations may be unrealistic.

The abilities implied in the term "information skills" vary in sophistication with the age of the student and the subject being researched. Further, the problems associated with planning, regulating and monitoring the processes underlying topic work have yet to be addressed directly. These processes, together with knowledge of oneself as a learner, come together in the concept of metacognition. Although no studies have yet been published which explicitly examine the metacognitive aspects of information skills, a few articles have recently appeared which make the relationship between the two areas of interest quite clear (Bertland, 1986; Mancall, Aaron and Walker, 1986).

Many of the abilities which underlie information skills are rarely addressed explicitly in the classroom. Much has been written from the adult viewpoint and knowledge-base about the knowledge children should have and the strategies they should use when seeking information. Researchers from both library and teaching professions are calling for more substantial teaching attention to be given to these skills, yet little is known about the skills children spontaneously use or the problems they encounter in the broad context of the school library.

The present study aims to redress this imbalance by observing and asking the children themselves.

CHAPTER TWO

THE PRESENT STUDY

Teaching methods based on discovery principles are widely used throughout primary and secondary education in the belief that they foster independent enquiry, allow individualisation of teaching programmes and promote a sense of responsibility for and control of one's own learning. As previously noted, Avann (1985) suggests that at their best, such methods provide children with opportunities to acquire and practise the skills of gathering and evaluating information from a variety of sources and this in itself may lead to critical use of resource materials and greater skills in reading and writing. In light of the information explosion, enhancement of these skills is a laudable aim, however such teaching methods are open to misinterpretation in that some practitioners assume that the tasks set in independent work are to be solved with a minimum of guidance (Gagne, 1977). This lack of guidance becomes evident in casual talks with parents of students who are expected to "do a project" on Ancient Egypt, the eighteenth century, conflict areas or a subject of their own choice. Frequently the learning experience, which is grounded in sound educational theory, becomes a stressful situation for both parents and pupils. Among teachers too, there is often a feeling of disappointment when the results of topic work are viewed. Many of the finished products seem to be little more than uncritical copying of resource material (Avann, 1985). Yet Lunzer and Gardener (1979) noted the children's enthusiasm for such work. This mismatch of expectations and outcomes may diminish if teachers consider the information skills inherent in the assignments alongside the end products. The previous discussion has emphasised the cognitive aspects of topic work in an attempt to illustrate just how many skills there are to develop in this area. The question is how can the potential for learning those information skills be exploited to better advantage? In addition, one must consider whether the newly

gained skills would be applied in areas other than those in which they were learned.

It is at this point that metacognitive research has much to offer since it has been demonstrated that attention to metacognitive functioning can enhance strategy maintenance and transfer (Palincsar and Brown, 1984; Belmont, Butterfield and Ferretti, 1982). The processes involved in metacognition are closely akin to those of information searching, yet are sufficiently different that observation of one sheds light on the other. Therefore, a brief discussion of metacognitive issues follows to make explicit this relationship and to provide a framework with which the sets of variables inherent in topic work can be viewed more clearly.

Metacognition is a term of fairly recent origin which is generally used to describe individuals' ability to understand and manipulate their own cognitive processes. It has been argued that this ability is an important factor in most types of communication, comprehension, writing, problem-solving, attention, memory, self-control and self-instruction (Flavell, 1981). Each of these cognitive activities is a feature of information skills and topic work.

Although the mental activities which comprise metacognition are still in dispute, there is general agreement that people can come to know about their mental states, cognitive strategies and the characteristics of particular tasks. They can also know about the interactions of these variables and their probable effect on the outcome of cognitive endeavour. This type of information about oneself as a learner is known as metacognitive knowledge. Further, people engage in active monitoring of knowledge states and strategies in order to make cognitive progress. They continually check the effectiveness of the strategies in use and keep track of where they are in problem-solving. The monitoring processes that facilitate this are known, within metacognition, as executive control processes.

Broadly speaking then, metacognition is divided into

metacognitive knowledge and the executive control processes which regulate the use of that knowledge (Brown, Bransford, Ferrara and Campione, 1983).

Executive control processes, in terms of evaluation, monitoring and regulation, feature frequently in the above discussion of information retrieval processes. While the focus of that discussion is centred on library systems and books, it is equally applicable to electronic data bases, visual or auditory information sources.

Executive control processes provide constant evaluation of cognitive activity so that, for example, questions can be asked and learning strategies can be changed. Information seeking demands these same activities on the part of the learner. Evaluation of progress or changes in knowledge implies the availability of some cognitive map of what one is trying to achieve and the path by which that goal can be reached. That is, if educators would like children to engage in these higher order thinking skills during topic work, the children must understand something of the procedures involved in information retrieval. However, Liesener (1985) holds that teachers themselves have "incredibly low levels of both awareness and skills" in this area. Thus an analysis of topic work which includes the underlying thinking skills should shed light on the task demands as experienced by children and the degree to which they are planning, regulating and evaluating the activity.

It is obvious from the previous chapter that the outcome of topic work is influenced by many variables, both physical and cognitive. Whilst many can be explored independently of eachother, the child grappling with topic work must deal with them simultaneously. Thus a naturalistic study has potential to demonstrate how children cope with the complexities and perhaps to uncover issues usually hidden from the adult observer. These same complexities are likely to result in a tangled web of information which defies analysis unless some order is imposed upon it. Here it is proposed to use the organisational framework adapted by Bransford (1979). This has subsequently been used to

describe the relationship between the cognitive and metacognitive aspects of thinking (Brown et al, 1983).

Bransford suggests that any general question about learning and understanding involves the simultaneous consideration of four basic sets of variables. These are:

1 the characteristics of the learner
2 the learning activities undertaken
3 the nature of the materials, and
4 the criterial tasks used to evaluate the learning that takes place (Bransford, 1979).

The factors which constitute each of these sets of variables interact. For example, a recognition test implies the use of different learning activities to those needed for recall or demonstration of conceptual understanding. Brown et al (1983) suggest that on a personal level, metacognitive knowledge consists of what one can come to know about each of these sets of variables and their interactions. Executive control processes come into play as the individual uses this knowledge to plan, coordinate, monitor and regulate the use of cognitive strategies in achieving goals.

The actual contents of the four basic sets of variables change with respect to specific learning situations. Figure 1 (page 26) illustrates some of those appropriate to topic work and library research. Specifically, learner characteristics to be taken into account should include existing knowledge of the topic, knowledge of library systems and books, reading ability, interests and motivation, and problem-solving abilities. The learning activities at the very least include generation of questions and keywords, skim reading, note taking and organising information. To discuss the nature of the materials one must consider the library system, indexing systems and the level of reading difficulty of the books themselves. Finally, under criterial tasks, one must reflect on how the teacher is to evaluate the finished product as well as the child's on-going attempts to monitor progress through the task, i.e. metacognitive functioning.

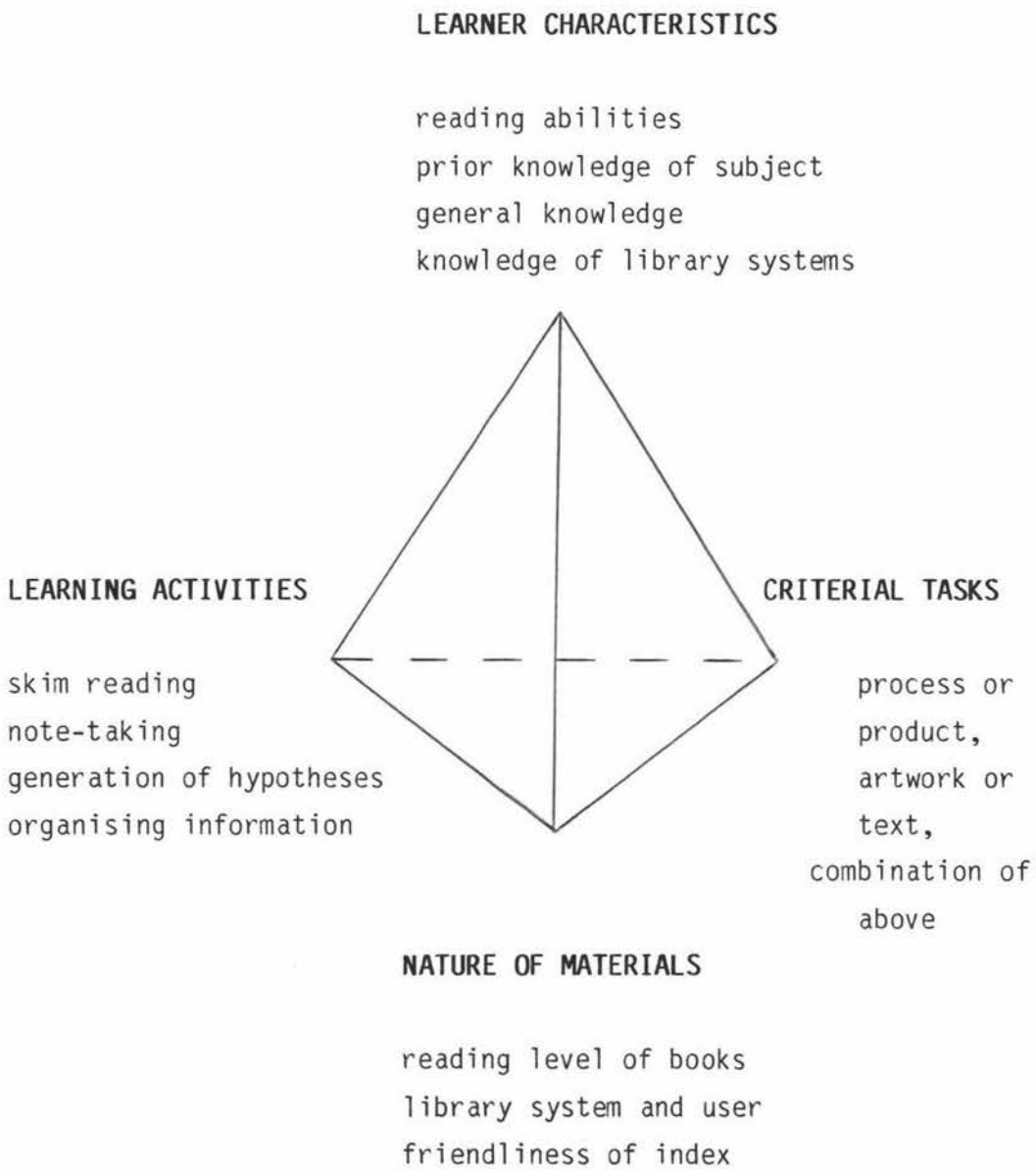

Figure 1. An organisational framework for exploring questions about learning as applied to topic work (after Bransford, 1979).

A detailed analysis of each of these elements and their interactions would be complex indeed and may present methodological difficulties. Thus it is desirable that a smaller study be carried out which can be used as a preliminary focus to help refine the questions guiding the more ambitious study. To that end it is proposed to examine just one of the four basic sets of variables mentioned above. Children have little control over the nature of the materials, i.e. the library system and the books within it, and adults have little appreciation of how the children view these. Therefore, an important step towards teaching information skills efficiently would seem to lie in increasing our understanding of children's interactions with information sources in the context of the library.

The present study arose in part from the above considerations together with findings from Moore's earlier library based observations. Given that the subject index is assumed to be the key to any library collection, Moore (1988) explored Standard 4 children's ability to generate subject headings appropriate to finding information in the Dewey Decimal system. This task proved problematic for children at all ability levels as did the task of scanning books to gain an idea of their contents. In the small sample observed (25 children) only six children could be said to check their judgements of contents efficiently. The rest relied heavily on titles and cover illustrations alone. When seeking specific information, the children experienced difficulty if the keyword they used to direct the search was not matched exactly in the catalogue or indexes of books. In addition, observation of these children revealed the heavy cognitive load that goes with information seeking and resulted in the suspicion that they did not use their existing knowledge to help them find information. In this case the information sought was simple and specific. For children faced with topic work at Form 1 level, the task is broader and more complex yet the assumption is often made that they can cope independently.

As Beal (1980) points out, the nature of indexing systems

tends to result in a highly structured view of the world and systems are sometimes accepted as unproblematic for the user. Further, Avann (1985) says that children should be taught that "information books" are (or should be) organized for information retrieval yet Miller's (1980) comments suggest that books aimed at young audiences often are not. Here it is proposed to carry out a descriptive study which tests these assumptions and identifies, from the children's viewpoint, the trials and tribulations of using library systems and books.

The particular aims of this study were to discover:

1 what sorts of questions children ask
2 how these are used to access relevant information
3 whether the keywords selected are compatible with both library cataloguing and book index systems
4 whether the library layout and Dewey Decimal system allow easy location of information for Form 1 students and
5 how children evaluate the usefulness of the information located.

The implications of the findings for both librarians and teachers will be discussed with special reference to fostering metacognitive and information skills.

CHAPTER THREE

METHOD

Subjects

The participants in the study were students from Form 1 at a suburban intermediate school. Their ages at the time of the study ranged from 10 years nine months to 12 years six months.

While no distinction was made on the basis of academic ability, it was thought to be preferable that all students have English as their first language or that they be demonstrably bilingual since task performance would be heavily biased against those having difficulties with the English language. The children's socio-economic backgrounds were diverse, thus their experiences of and levels of familiarity with library systems were likely to vary greatly. While these differences compound the problems inherent in the analysis of qualitative data, it was considered that our existing knowledge is too meagre to permit selection of a more homogenous group. In addition, the study aimed to describe the range of trials and tribulations faced by young information seekers.

This particular group of students was selected because their teacher had expressed interest in the research and was willing to tolerate minor disruptions to classroom routine. In addition parental permission was sought for each child to participate and only those returning permission slips were included in the study. The information and consent form sent to parents is appended (see Appendix 1). The children themselves signed consent forms giving permission for results to be communicated to interested parties as long as anonymity was respected (see Appendix 2). In the event, only class members who were absent or whose parents had declined permission did not take part. This resulted in a sample of 12 boys and 11 girls.

Interview Technique

Information gathering is driven by a "need to know". Therefore observation of children's interactions with information sources demands a real task which would allow them to satisfy such a need. In this case a topic work assignment was set which provided all participants with a need to find information to match their interpretation of the teacher's requirements. This level of "needing to know" may well differ from a similar need arising from a child's interests and self satisfaction but provides a starting point for exploring children's information seeking and a degree of consistency across the sample.

In addition, many of the issues of interest are bonded to children's perceptions and thinking. This implies that the researcher must access their thinking processes whilst they are engaged in information seeking. A small study by Moore (1987) showed that children at the Form 1 level would think aloud, especially when prompted with judicious questioning, and were then willing to expand on the information given in a retrospective interview. This dual interview technique allows the interviewer to clarify points raised in the initial interview and to "catch" those missed during the interaction. Whilst there is some dispute over the validity and reliability of such verbal data, Ericsson and Simon (1980) have discussed the conditions under which these are enhanced. They suggest that a request that an adult subject think aloud will yield more reliable cognitive process data than a request to give inferred reasons for behaviour. However, Scardemalia and Bereiter (1984) found that it is usually harder for children to verbalize such information than it is for adults. Frequently they have found that children become most interested in what the experimental procedures are allowing them to find out about their own mental processes. Consequently the researchers have used this interest to make children co-investigators of the covert processes. They give subjects practice in thinking aloud and give plenty of encouragement and prompting when silences fall. Thus the think

aloud procedure is supplemented with open ended questions which emphasise that it is the researchers who are having trouble understanding, not the children. Further, Scardemalia and Bereiter consider it vital that the children understand that the point of the activity is not successful or unsuccessful performance but is understanding the mental processes involved in the task.

This interview technique is not appropriate to all tasks since, for instance, reading and thinking aloud are incompatible. Thus retrospective interviews must be considered. These could also be used to overcome a problem noted by Brown et al (1983). They found that when points of difficulty occur, verbalisation of thoughts ceases, only to begin again when the cognitive load decreases. These points could be clarified retrospectively if they could be recalled. Ericsson and Simon's (1980) analysis suggests that retrospective interviews about cognitive processes will be subject to memory distortions but that reconstruction is likely to be more accurate when some form of cueing takes place. These factors, combined with the knowledge that an exhaustive behavioural checklist would be difficult to compile and use, prompted the use in the present study of a video camera to record the children's information seeking and think aloud interviews. This not only provided a clear and complete behavioural record but was immediately available for the children to view during a retrospective interview. This latter was recorded on a cassette tape with the interviewer verbally cueing the points at which the video and audio records matched (e.g. When you were looking at Meet the Birds....).

The task chosen as a vehicle for observing the children's information seeking attempts was highly similar to those usually undertaken by Form 1 students and was designed to be completed although research attention focused only on its beginning. This was done partially to ensure that the task was taken seriously by the children and also because the final use of information was of some interest. The manner of task presentation, to be described

in detail later, was that previously used by the class teacher in two topic assignments. Thus the task had some familiar features to guide the students.

The topic itself (BIRDS) had been chosen with reference children's knowledge in that it was assumed that it would not be totally unfamiliar and that it favoured neither boys' nor girls' stereotyped interests.

Task Setting and Equipment

The school library used for this task is well established. A comprehensive catalogue exists for both fiction and non-fiction, with the latter being organised according to the Dewey Decimal system. Attached to the main library is a learning resource centre which houses, among other things, the library's collection of encyclopaedias. This room was unavailable to subjects during the recorded interview but could be used for the completion of the assignment.

The library is staffed by a teacher-librarian, a teacher's aid who is a qualified librarian and a rostered group of student librarians. These students are volunteers who receive on-going training.

For the topic in question the library had on its shelves 35 books on various aspects of BIRDS. Thus it seemed likely that individual interests would be catered for. These books were positioned on the top shelf to the right of the non-fiction catalogue. The first participant in the study found some books mis-shelved on the bottom shelf to the left of the catalogue, therefore the interviewer ensured that some bird books were in this position for each student.

The video camera used during the study was mounted on a tripod facing children while they were seated at a table and was hand held whilst following them to the shelving. Sound recording relied upon the camera's built in microphone thus reducing the presence of trailing wires which might tangle in furniture and feet as the children moved around the library. The cassette

recorder used in the retrospective interview was hand held and also had a built in microphone. This machine was quite unobtrusive and it was hoped that those made nervous by the video camera would talk more freely if they forgot the presence of the cassette recorder.

Procedure

Prior to interviewing children, the reasons for the study and the method of data collection were discussed with the entire class. This ensured that they gave informed consent for recording and information use, and allowed any qualms to be dealt with. The non-evaluative nature of the study was stressed as was the fact that they would be teaching the interviewer about information seeking. Thus they were encouraged to be co-investigators as suggested by Scardemalia and Bereiter (1984).

To ensure a degree of privacy, children other than those being interviewed were excluded from the school library during observations and recording. Each subject therefore had unobstructed access to the main library collection and was interviewed on a one to one basis. Children came for their interviews in random order and the interviewer had no prior conception of their ability. On arrival they were seated at a table facing the video camera and were given a puzzle to work on while they practised thinking aloud. This was a very casual practice during which rapport was established and the subjects became accustomed to the presence of the camera. Since Moore's 1987 study found that some children tended to give a running commentary on their actual physical movements, this activity allowed the interviewer to reinforce comments about thinking.

Once children seemed relaxed, they were given the following information:

"I know you've done projects with your teacher before and I'd like you to tackle this one in the way she's shown you. While you're thinking about the questions you'd like to answer on the topic and while you're looking for some books to help you,

I'd like you to think aloud. I'll ask you questions to help you share what you're thinking."

They were then given a contract form drawn up by their teacher (see Appendix 3) and told that they would have a week in which to complete the work. To prevent resources dwindling during the four weeks of the research, children were asked not to remove books on the topic but to use them in the library. Since access to the library for research purposes was restricted to one day a week, only five or six children were engaged on the topic at any one time. This meant that a further request had to be made of them: "I would ask you not to tell the other children what the topic is as that will spoil their chances of sharing all their thinking with me."

At this point any questions they had about the procedure were answered and they were told that the topic for the project was BIRDS.

During the following 20 minutes their attempts to come up with questions were recorded and then they were followed around the library shelves as they sought information. At this stage the camera person endeavoured to look over their shoulders yet remain as unobtrusive as possible. The interviewer questioned points, sought clarification and made written record of points which might not be clear from the recording or which deserved further attention during the retrospective interview.

On completion of the think aloud interview, the video recording was played back to the subjects and their efforts to find information were discussed further. Although questions of interest had been listed to guide the interviewer and provide some comparability across the sample, the actual content of each interview was open-ended, depending on the subject's actual performance.

The total duration of interviews was about 40 minutes, being made up of about 5 to 10 minutes practising thinking aloud, 20 minutes working on the topic and 10 or more minutes in retrospective interview. This schedule was selected in consideration of children's concentration spans, the intensity of

the interviewing situation and the physical fatigue involved in hand holding the video camera.

Once all interviews had been completed, a class discussion was held so that any concerns could be voiced and some general feedback could be given to the children. Finished projects were collected, photocopied and returned to the teacher for marking.

Complete transcripts of all video and audio records were then prepared for analysis. See Appendix 4 for a sample transcription.

Data Analysis

Before analysing the data collected, the prepared transcripts were checked to test whether they were a true record of the verbal exchanges which took place. An independent observer, who had not been present during the interviews, randomly selected three video recordings and their associated audio recordings and transcribed them. These transcriptions were then compared word by word with those prepared by the interviewer. A tally was kept of the number of occasions on which there was agreement that a word had occurred and that that word was correctly transcribed, and of the occasions were there was disagreement that a word had occurred or disagreement on what particular words were. It was found that there was 97.5% agreement that a complete word had been uttered and was correctly transcribed. Disagreement that words had in fact occurred was limited largely to instances where a subject repeated occasional words.

The next step was to construct categories for analysing the data. The interviews were open ended and therefore the data were highly variable and yielded information about the characteristics of the learner, learning activities engaged in, the nature of the materials and the children's awareness of the teacher's criteria for evaluation as well as their own on-going evaluation and monitoring of the information seeking process. The focus here is to be on the nature of the materials but this has many aspects,

some of which are inseparable from the children's thinking and perceptual processes. That is, some aspects were directly observable while others required a degree of inference. The unit of analysis in this latter case varied from single sentences which appeared to be clear reflections of events, to consideration of several interviewer-subject exchanges. Visual and transcribed materials were used in conjunction to check and clarify many such inferences.

In order to ensure a degree of similarity among interviews, a questioning guide had been constructed prior to data collection which reflected the issues outlined in the previous chapters (see Appendix 5). This contributed to the ease of identification of categories based on the steps the children used in information seeking.

The progression, although not strictly linear, appeared to be:

1 generate questions
2 select keywords to direct search
3 check catalogue
4 locate books
5 select books
6 select keywords for individual book searching
7 produce written work (not observed).

The criteria by which events were judged to fit particular categories and details of the categories themselves appear below.

Generation of questions

The actual thinking behind question generation is not of concern in this study but the relationship between questions asked, keywords selected and their relevance to information seeking aids such as catalogues, indexes and tables of contents is. The questions children asked were accessible from transcripts and the interviewer's notes. If the subject had not actually verbalised a question, the interviewer had usually done so or had copied it as the child wrote.

Selection of keywords for catalogue searching

All children were asked where they would look for the needed information and many included in their reply the exact word they would seek. If not, this information was evident from sight of the actual catalogue card chosen or from their speech while looking for that card and deciding its meaning.

A related category concerned whether the chosen keywords did in fact appear in the catalogue. This information was similarly evident from speech and observation.

Checking the catalogue

Several categories were needed to describe interactions with the catalogue, some of which only became evident after the preliminary viewing of the tapes.

Categories directly observable or explicitly detailed in the children's speech were as follows:

1 Section of the catalogue used - fiction, non-fiction, author, title, subject or classified.

2 Whether children accepted the first specific entry seen or checked for other entries on that topic.

3 Nature of the entry attended - single Dewey number, multiple Dewey numbers.

4 Alternative subject words sought in catalogue.

Those categories demanding a degree of inference were:

5 Confusion evident over meaning of fiction and non-fiction:- this was inferred from direct statements or use of the fiction catalogue to find the desired factual information.

6 Understanding of the Dewey Decimal system:- this was judged on two levels from the children's replies to direct questioning about the meaning of the numbers on subject index cards. Basic number understanding was assumed if the child mentioned general location of books on the shelf or contents of general categories such as 500s are SCIENCE books. To be credited with an understanding of the Dewey Decimal points, a statement

reflecting the differentiation of aspects of a topic was required.

7 Confusion due to the number of Dewey numbers appearing on any one subject index card or to several cards being present for the same subject:- this was considered to exist when reflected in direct statements and not considered to exist when no hestitation in number selection was evident.

Location of books

Here again, many categories were needed to describe problems with shelving arrangements and how a section of shelving was located.

1 Subject sees shelving as continuous or as separate bays: this was determined from verbalisations about shelving and from movements seen when children came to the end of a shelf. Children who saw the shelving as continuous were likely to move to the extreme left of the shelf below the one they had been searching. Children who were aware of shelving bays remained standing where they were but dropped their line of sight to the same position on the shelf below.

2 Use of shelving guides:- this was inferred from speech referring to either numerical or word shelf guides and from observation of touching or pointing to such aids.

3 Accidental location of required books:- this category was reserved for instances where children were observed to glance at the shelves and see the right section either immediately or after a period of searching fruitlessly.

4 Did not appear to use shelf guides:- the children searched at length but in an unsystematic manner i.e. they did not look for the shelf guide with the nearest number to that required but looked along the shelves randomly.

5 Child seeks the book with the correct number:- the

criterion for this category was that the child specifically made reference to there being just one book with a particular Dewey number.

6 Child seeks a book with the chosen keywords in the title:- here the child answered a direct question about the words sought in the title by rigidly adhering to pre-selected keywords.

7 Child finds only the mis-shelved books, only the correct section of books, both groups or needed a prompt to locate the correct section:- this was evident from the locations searched and shown on video and the presence of prompts in the transcripts.

Gathering books for information searching

This section examined both children's selection of books for perusal and the strategies used for assessing the content of books. Children's comments about the books themselves are also included here.

1 Child used title, picture and/or cover blurb to determine content of books:- This category was used where children said a lot about the contents of a book without opening it.

2 Child purposively turns to contents or index:- this was easily seen from the video recordings and commented on in the children's speech.

3 Index and contents were narrower than expected:- here children had to make some direct comment about the nature of the entries in the contents or index, together with some indication that their expectations were different.

4 Presence of alternative strategies when a table of contents or an index was lacking:- the observer noted whether the book was immediately rejected or another information seeking aid was located. Again both direct speech and video recordings were used to decide on inclusion in this category.

5 Children's comments about the books themselves.

Selection of keywords for individual book searching

Although the use of keywords in evaluating books for selection is implied above, the actual choice of keywords is more dependent on the children's original questions and modes of thinking than on the books and the presence or absence of indexes and tables of contents. Thus keyword selection deserves separate consideration. The keywords selected were determined from children's comments and answers to direct questioning about the words sought in contents, indexes and text. The appropriateness of these words was assessed by use of two categories which noted whether the chosen words appeared in the books and whether they accessed relevant information as evaluated by the children.

The information seeking process

A number of overall process categories were also constructed as follows:-

1 Did the children record bibliographic details of books for future reference?
2 Did the children seek one book for each question or search each book for answers to all questions posed?
3 Did the children think they had found enough information during the interview to answer at least one question?
4 Would they use the same strategies for the rest of their information search?
5 Would they would seek help from teachers and librarians?
6 What were their preferred sources of information?
7 Did the children answer the questions they had set themselves?

The reliability of the above categorisation was checked by independent analysis of five randomly selected videos and their corresponding cassettes and transcripts. Since some categories could be decided only with supporting non-verbal evidence from video tapes (e.g. whether shelves were seen as continuous or as

separate bays) a summary sheet was used which merged data from transcripts, videos and finished projects. Individual categories demanded different codings which varied from the actual keywords used by a child, to whether or not a particular behaviour was present, not present or was unclear. Reliability checks focused on the data summary. Over a total of 155 categories there were 20 disagreements, which gives an agreement level in the coding of categories of 87.3%.

The following chapter presents the findings of the study together with illustrative comments from the children themselves.

CHAPTER FOUR

RESULTS

Generation of questions

The children asked on average 3.5 questions, with 5 being the most set by any child and 2 the least. For some children this aspect of topic work was difficult and worrying, whereas for others, questions seemed to come easily. For all children the difficulties involved in question formulation were, however, more apparent when the quality of questions was examined and the children's use of these to begin information searching was observed. This relationship will be explored in detail when selection of keywords for individual book searching is discussed but some examples of typical questions are included here:

What kinds of birds are there? What do they eat?
What birds are near extinction? What is a bird?
What are birds in danger of? How do birds fly?

Perhaps the loosest measure of the relationship between questions asked and their use in accessing information is found in the final work presented. Without taking account of the quality of answers, it was found that only 48% of the questions set during the interviews were answered in written work and three subjects presented no written work at all. Eleven children supplied answers to questions other than those set during the interview. The information found seemed to become the information required in these cases and new questions were added to justify the inclusion of that information in the final projects. Two children completely ignored their original questions and eight children answered only the questions they generated during the interview.

Selection of keywords for catalogue searching

20 of the 23 subjects automatically selected BIRDS as the relevant keyword for searching the catalogue and if they used the non-fiction subject index they were assured of finding one or

more of four matches. Two of the remaining subjects were more specific, one sought ENDANGERED BIRDS and the other, EAGLES, neither of which is in the non-fiction subject index. Having failed to find ENDANGERED BIRDS, Subject 16 sought KIWI and when that too produced no information, the general term BIRDS was selected. Subject 19 sought nothing further in the index when it was apparent that EAGLES was not an entry.

Subject 7 had had great difficulty in formulating questions. She embarked on the information seeking phase of the study with no clear idea of what she was seeking. Although the word BIRD appeared in her questions, she selected ZOO as the keyword. The problems arising from this will be discussed later.

Checking the catalogue

Observations of children checking the catalogue are summarised in Table 1 and discussed below.

Before children could check the catalogue they had to decide which was more appropriate - fiction or non-fiction. For four children this demanded some thought and for two of them it was solved through trial and error. Subject 15 realised his mistake as soon as he opened the fiction title index and quickly went to the non-fiction subject index. Subject 20 only came unprompted to the non-fiction subject index after a futile search of the fiction shelves. Her uncertainty was evident when asked where she would find the required information:

S20: In the fiction catalogue, (gestures towards it). I'd look for um, birds.

Interviewer: Uhuh. Okay, that's fine. Shall we do that?

S20: (Stands in front of catalogue looking puzzled.)

Interviewer: A problem?

S20: It'd be a fiction title, eh?

Interviewer: It would be a fiction title?

S20: Yeah. Or would it be a fiction author?

Interviewer: I don't know, which would it be? What do you think it would be?

S20: Birds, I suppose it would be a title.

Table 1

Summary of children's interaction with the catalogue.

Category	n subjects
Confusion between fiction and non-fiction	4
Section of catalogue first used	
non-fiction subject	21
fiction title	2
Selection of index card	
1st card seen	14
examined several cards	6
2 single entry cards	2
no cards	1
Choice of Dewey numbers resulted in confusion	7
Understanding of Dewey system	
no understanding	1
unclear	4
general topic location	17
differentiation of aspects	1
Used alternative words to search catalogue	1

She then identified a title Birds by Wildsmith and moved towards the appropriate section of the fiction shelving. On the way she paused to glance at the non-fiction section. She said she thought she had done something wrong but went to the fiction area anyway. Once at the 'W' section of shelving she looked for Birds without realising that the books were arranged according to authors' surnames, not alphabetically by title. She had not in fact noted the author's name and only after an extensive search of that section did she decide to use the non-fiction catalogue. However, this decision did not signal the end of her problems:

S2O: (Moves to non-fiction catalogue and opens A - D drawer) Now I'll go down to B. (Stops looking at index cards abruptly, stands back looking confused, shuts draw.)

Interviewer: Now what did you find there?

S2O: Names. I think it's authors or something, I don't know.

Interviewer: You're not really sure what this means? (Points to SUBJECT label on drawer.)

S2O: No.

Interviewer: Is that the problem?

S2O: Yes. Oh, subject ... oh, hang on ...

Interviewer: Subject, what does that help you remember?

S2O: Oh, title, um, the thing like birds is the subject, the topic. So that should be right, shouldn't it?

She gave the reason for this particular confusion as having had sight of a single index card with an entry she did not understand (BALLADS).

Every subject eventually used the non-fiction catalogue and searched the subject index. However, selection of one section of the catalogue over the other was not always straight forward. Subject 8 approached the classified section first but rejected it when she realised that she did not know the Dewey number for BIRDS. The rest of the subjects seemed to ignore the presence of the classified index but two took some time to decide which

drawer of the subject index was appropriate. One had merely forgotten the order of the alphabet momentarily while the source of the other's problem was not clarified.

Subject 7 intended to look for ZOO but opened the A - D drawer. The cards were parted at the entry for BIRDS and she read the word aloud, shut the drawer and moved to the last subject index drawer. She told the interviewer that ZOO was not there, saw an entry for ZOOLOGY and located that section of books. (Care was taken to ensure that the index cards were not parted for any other child.)

Finally, Subject 23 used the catalogue adequately on this occasion but confessed that he does not use it very often "cos I can't, I do use it sometimes but that's if there's a certain book.... I just go over to that shelf there normally and I just look through them."

Children had different strategies for searching the subject index. 14 children accepted the first BIRD entry seen, six examined more than one entry then chose those they considered to be appropriate, two accepted the first entry seen then returned to look for other entries later and one child, having failed to find his chosen keyword (EAGLES) rejected the catalogue thereafter.

The information on the four subject index cards varied greatly and had the potential to send children to three widely separated sections of shelving. Figure 2 is a reproduction of the information seen by the children. 15 children selected Dewey numbers from the card with mulitple entries, six selected cards with single entries, one used both multiple and single entry cards and one saw no cards.

The choice of Dewey numbers presented to the children at this stage posed problems for seven children who attended to the multiple entry card. For three of them the problem was compounded by the presence of single entry cards as well. They had difficulty deciding which entry they should follow up. One of these, Subject 8, seemed to assume that the presence of two index cards with the same number meant that there were two books

Figure 2. **Non-fiction Subject Index Entries found by 21 of 23 subjects.**

on the topic. Four children saw only a single entry and therefore had no choice to make. Subjects 10 and 23 failed to find any relevant information at the first location they selected and returned to the catalogue to choose an alternative BIRD entry. Both again selected from the single entry cards, but it is not certain that they actually saw the multiple entry card and rejected it. The remaining children did not seem confused by the variety of numbers presented but many gave the impression that they did not think about it at all, merely that they followed up the first entry listed. Subject 15 interpreted the index cards in terms of a range of books - bird books will be located from 598 through to 636. Only Subject 2 overtly took time to evaluate each entry with respect to her questions before deciding to look for 598 and 598.2.

This brings us to the question of what the numbers mean to the children and whether they understand the Dewey decimal system. Only one subject seemed to have no understanding of the system at all. He asked the interviewer what the decimal points meant and said that he did not know what 598 meant. This could well account for his abandonment of the catalogue when he failed to find an entry for EAGLES. Four subjects gave no verbal evidence of understanding that Dewey numbers represent a topic and a shelving location but three of these had no difficulty finding the right section. In contrast, some children who did describe Dewey numbers in terms of topic location had trouble actually finding the books. The barriers to book location are described later.

Although interviews were not standardized, most children who found the multiple entry card were asked whether they understood the numbers and if so, what was the difference between them. The following examples were typical answers.

Interviewer: Do you understand what all those numbers mean?

S8: Oh, um, they're the.. I think it's Dewey number or something and you look it up (points to spine of a book).

Interviewer: Fine. Do you understand what the difference between

that one and that one is though?

S8: No, I know that's longer but that's all.

Interviewer: That last number you've written down, can you tell me what it actually means? [598.29931]

S12: Well, it's where you find...oh, I don't know about that! Mmmm.

Interviewer: What, you know what that one means, do you?

S12: Yeah, that's the Dewey number, 598.

Interviewer: Okay, what does it do?

S12: That's where you find the book.

Interviewer: Okay, what about this one here [598.2]?

S12: Point 2, that's um, still the same type of thing. Except it's just got on the book point 2 as well.

Interviewer: Do you know what all those numbers mean?

S13: Um, they're Dewey numbers, where you find it on the back...

Interviewer: Okay, can you tell the difference between those and what they actually mean? They're all Dewey numbers aren't they?

S13: Yeah.

Interviewer: Do you understand that one?

S13: I don't know what they mean.

Interviewer: Okay, so you don't know what they mean but you know you'll find them on the back of books.

S13: I think we got told.

Interviewer: Pardon?

S13: I think we got told one time but I've forgotten.

It was concluded from such comments that 17 subjects had a basic understanding of the Dewey system which related the numbers to topic locations. Only one subject was credited with an understanding of the Dewey decimal points:

Interviewer: Okay, do you know what all these numbers mean?

S14: Yep, there's different birds 598, that's probably

birds, you know, birds, and then comes two different kinds of birds.

Interviewer: Yes, what about this bottom number here? The 29931, what does that mean?

S14: Oh that means, well, getting more complicated and different sorts of birds.

This boy's approach to information searching, as will be seen later, was very sophisticated.

Finally, with regard to catalogue use, it is worth noting that only one child returned to the catalogue during information seeking to check an alternative word. This was after a failure to find information on bird nesting habits. Subject 1 thought she could look up NESTS but felt that that would cover all animal nests, not just birds. She did look but was not surprised that the term was not included. Similarly, Subject 20 thought of looking for ALBATROSS. She did not actually search for it as she believed that the index would not have both BIRDS and ALBATROSS. (In this case she was correct.)

Location of books

Table 2 summarises the findings relating to book location. These are discussed below.

The categories used to describe children's location of books fall into two groups: those to do with location of the section of shelving matching the Dewey number sought and those to do with the location of individual books within that section. The former will be dealt with first.

When moving from the catalogue to the shelving, it might be expected that numerical shelf guides would assist children in locating the Dewey number they have just selected. However, observation of these Form 1 children showed that provision of shelf guides does not always help and may influence the children's perception of the shelving adversely.

Not all children verbalised what they were looking at and many gave no non-verbal clues, therefore for 10 subjects actual

Table 2.

Summary of children's location of books.

Category	n subjects
Use of shelving guides	
unclear	10
did not use	3
numerical	6
word	2
both numerical and word	2
Perception of shelving system	
unclear	13
continuous	7
separate bays	3
BIRD books actually located	
mis-shelved only	7
mis-shelved and correct section unprompted	4
correct section only	11
none	1
Searched for the one book which matched the chosen Dewey number	6
Searched for exact keyword match between catalogue and book title	7

use of shelving guides is unclear. Of the remaining 13, three subjects appeared not to use shelving guides at all since they ignored their presence and searched unsystematically. For most children using numerical shelf guides, the target number was 598 and most of them sought the 500 guide to begin their search. Only two subjects noted that 598 was close to 600 and began the search from the 600 end.

To further aid children in locating books, shelf guides with a single word upon them were also present. In the section most used during this study, children were likely to see guides for SCIENCES, ANIMALS and PETS. Only the SCIENCE guide was immediately adjacent to a numerical guide. Two children specifically referred to the word guides during their search and two others made use of both numerical and word shelf guides. For one, the presence of both sorts of guides posed a major problem but since this was partially tied to her perception of the physical shelving system, discussion will be postponed temporarily.

As in the case of shelf guides, perceptions of the physical shelving were not always apparent from the children's speech and non-verbal behaviour. However, for seven subjects the shelving obviously caused problems. (To clarify the nature of these, an illustration of the relevant shelf layout appears in Figure 3. Shelves have been labelled alphabetically to allow clear descriptions of behaviour to be made.)

These seven subjects saw continuous shelves of books rather than seeing (as did three subjects) adjacent shelving units (or bays) filled with books. That is, if they went to the 500 shelf guide, they expected the Dewey numbers to be continuous across shelves C and G and did not note the numerical discontinuity occurring where shelving bays touched. Neither did they look at shelves E and F for 500 books. When they reached the end of shelf G, they moved to the extreme left of the shelves D and H (a position not illustrated) to seek the book with the next Dewey number. In one case, a subject moved from shelf G to K and H to L. Whilst not quite so marked, Subject 8 had difficulty on this

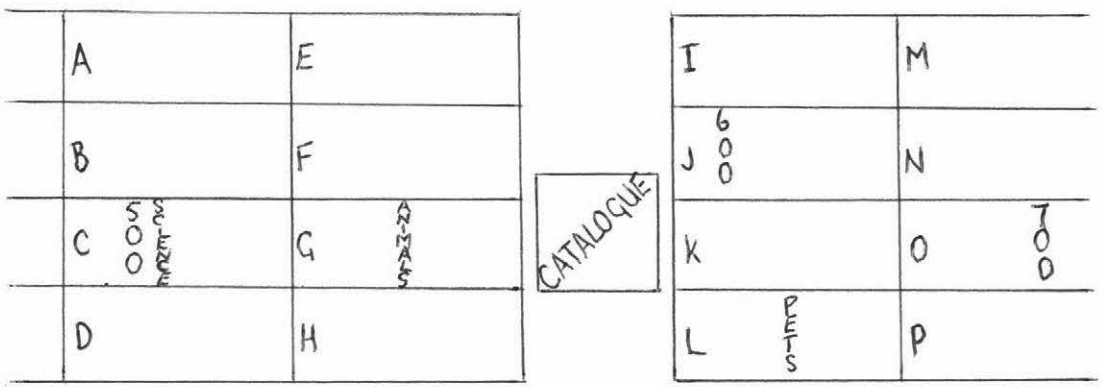

Figure 3. Shelving layout of non-fiction collection relevant to searching for BIRDS, 598 and 598.2.

level to which was added confusion because both word and numerical shelf guides were present. After an unsuccessful search for relevant information under 598 (she had found only a few mis-shelved books) she searched for BIRDS - PETS at 636.61. She moved from shelf H to shelf J, returned to check the number of the last book on shelf H and then returned to J. She did not seem to notice shelf I at all. (A few other subjects seemed to overlook it as well, particularly if they were not tall.) At this point she said:

S8: I'm not sure whether they'd have it in order of the numbers or um, whether they'd have it under BIRDS.....ah! (points to shelf guide PETS).

Interviewer: Why aren't you sure?

S8: I'm not sure because they have, because they have um, 6 maybe down here and 5 up there... 6 down here and um, 7 up there and I thought they may have it in the order of the numbers.

Interviewer: Okay, let's explore this a moment. When you go along here [shelf J] did you see that sign there for 600?

S8: Um, no.

Interviewer: Alright. Well, there's the 600 starting here, where do they go after there (pointing to end of shelf J)?

S8: Up to there, I see...(trailed fingers along shelving J and N then pointed to far right of shelf, dropped down to K and trailed fingers across to the 700 shelf guide before standing back from shelving, looking puzzled).

Interviewer: So you think that the 600s go along here and then along here to there, is that right?

S8: Yes. Oh, but there's some down there [shelf L] as well.

Interviewer: How do you account for that?

S8: And there's some down there...I'm not sure. They seem..... (long silence).

Interviewer: It's a common confusion, I've seen lots of other children do it too and if you can tell me what you find confusing about it, it will help.

S8: I find it confusing because ... because I think they sh.. I think it could be in the um, in the category of PETS like that instead of in both.

Interviewer: In the numerical order?

S8: Yes, well, they have some, some like that, some in the categories like PETS and POETRY and some just like that (pointing to a numerical section with no shelf guide) so.....

An additional problem was caused by the presence, as mentioned above, of three mis-shelved books that were not discovered until after the start of observations. Since mis-shelving is a common occurrence in most libraries, they were not re-shelved but were placed at that location for all subjects. Eleven subjects found the mis-shelved books but only four of these went on to locate the correct section unprompted. Six subjects assumed the mis-shelved books were the only ones available on the topic and Subject 5 suggested that all the others were out on loan. Subject 6 made a similar assumption

when he accidentally sought 398 instead of 598 and could not find it. Subject 15 was shown the location of the bulk of the 598s when video recording ceased and in his retrospective interview he was asked why he did not find them unaided:

S15: Well, um probably cos um, I wouldn't think to go and look in another place. I'd probably think all the 598 books were in that particular place.

Interviewer: Yet they were at the very end of a shelf, weren't they? And you wouldn't think to go on up to the next shelf?

S15: No.

Eleven subjects located the bulk of the 598s without locating the mis-shelved books. Some of these subjects found them very rapidly and five subjects found them purely by accident. The remaining subject, Subject 7 sought ZOOLOGY and located the animal books but never, even during the week allowed for completion of the project, did she find the 598s. Her finished work covered less than one page and came with a note:

"I looked everywhere for information, I mean everywhere. Sorry."

The references she provided for her written work (on questions totally different to those formulated during the interview) were The 1987 Guiness Book of Records, The New Zealand Road Atlas and The New Zealand Almanac. This was despite the fact that the library had 35 bird books on the main shelves plus the encyclopaedias and some more New Zealand bird books in the learning resource centre attached to the library. This subject also found information relevant to her questions during the interview and had had sight of the BIRD cards in the catalogue! Paradoxically, she located the ZOOLOGY section with ease, thus suggesting that she did understand that Dewey numbers signal a topic and location.

From this it would appear that having a basic understanding of Dewey numbers does not guarantee that the books will be found. Assuming the relevant section is found, one must then

find the "right" book. The children's approaches to this task will be discussed next.

Although not always apparent when the children were hunting in the catalogue, it appears that some children think that an entry in the subject card index represents one book on the shelf. Again Subject 8 provides the example:

Interviewer: What are you looking for?

S8: This (reaches for The Complete Book of New Zealand Birds, ticks off one Dewey number on paper.)

Interviewer: When you ticked that off, what did you mean by that?

S8: I've found my book that I was looking for.

Interviewer: How do you know that that's the book you were looking for?

S8: (Indistinct mumble.)

Interviewer: Is that simply because of the number or...what is it?

S8: Well, I think so. It's what was in there (points to catalogue) and it's got the New Zealand sign so it's... I think it's the book.

(All books about New Zealand have a sticker with a Maori design on the spine and she had looked at the BIRDS - New Zealand 598 NZ card in the catalogue.)

An additional example is provided by Subject 17:

Interviewer: Why don't you want 598?

S17: Because that won't give me what the book, which one the book is because there'll probably be 598, one 598 2, 598... there usually is anyway.

A total of six subjects made comments along these lines. All but one of them found the few mis-shelved books and only two went on to find the correct section. Finding so few books may well have confirmed the idea that one index card matches one book.

Dewey decimal points are open to mis-interpretation of a similar kind. Subject 3 related the decimal points to the number of books in the library collection, saying that points only

appear if there are a lot of books on the topic and for Subject 4 the points merely meant another bird book in addition to the one labelled 598. One gained the overall impression that several other children thought this way as well, but the evidence is not clear.

With regard to location of books with Dewey decimal points, only one child voiced confusion. Subject 6 sought BIRDS - PETS at 636.61 and although he found 636 he could not find 636.61. He came to the conclusion that "...there's probably no books with that heading" despite the inclusion of that heading in the catalogue. Most children seemed to hunt for a particular number and when one book of that number was found, they then switched to reading titles and ignored numbers. Thus in this case they found 598.2 by locating 598 and reading along the shelf. However, this tripped two children up. Three books labelled 598.1 were naturally enough wedged between 598 and 598.2. The problem was that these were about REPTILES! Both children reacted in some surprise and rejected the books quickly. One of them, Subject 17, initially went no further along the shelf as she assumed she had reached the end of the bird book collection. Other children either ignored those books on the basis that their titles had nothing to do with birds or simply did not see them (they were all quite slim volumes).

The final issue to be addressed here relates to the word chosen for searching the catalogue and the words expected to be in the titles of books. In seven cases children expected an exact match between the subject word sought in the catalogue or a keyword chosen for a particular question and words appearing in the titles of books. For three subjects this was a sensible expectation which allowed them to disregard many inapropriate books. They all wanted information specific to NEW ZEALAND and therefore sought books with New Zealand in the title. In contrast, Subject 2 looked for a book about "what birds eat" and Subject 5 looked for "flight":

> S5: ...."Town Birds in New Zealand". I'm trying to find um, flight, flying birds, um birds flight or

something, I'm not sure.

Interviewer: So are you looking for a title that says bird's flight?

S5: Yeah.

Interviewer: If you don't find a title that says bird's flight, what will you do?

S5: Well, I could look up in an encyclopaedia to find something about it.

Neither Subject 2 nor Subject 5 found what they were seeking, leading Subject 2 to conclude that there are not many books that say what birds eat.

The remaining two subjects who sought exact title matches chose the word BIRDS. This resulted in a great number of matches but they may have been less successful using such a general term had a different topic been set.

Having found the BIRD book collection, children had next to choose books for closer examination and then to search them for relevant information. Both these tasks implied use of keywords to help focus the search, but the former depended somewhat on the general appearance of books, therefore this will be discussed before turning to the children's conception of words appropriate to searching for topic information.

Gathering books for information seeking

The children's strategies for selecting books for closer examination are summarised in Table 3.

Fourteen children made clear statements that they relied upon the title and cover illustration of a book in choosing which books to peruse. It was unclear whether the remaining children used the cover information in this way or not. Given that there is a vast number of books on the shelf, such a selection mechanism is essential but as noted previously, seven children expected an exact match between their chosen keywords and the words in the titles of books. These subjects had difficulty finding any books which appeared to be worth searching. In

Table 3

Summary of children's gathering of books for information seeking.

Category	n subjects
Used title and cover illustration to select books	14
Predicted contents on basis of cover alone	2
Book organisation aid used	
index	7
contents	2
contents and/or index	9
random scan	1
contents/index or random scan	4
Strategy used if contents or index lacking	
seeks alternative organisation aid	2
rejects volume	1
random scan of text	2
Information in index did not meet expectations	9

contrast, the other children seemed more flexible in their approach to book selection. They rejected books if the titles included words totally inappropriate to the topic sought, and opened those whose titles were ambiguous or contained words related to their topic of interest in any way. For example Subject 23 rejected Birds of the New Zealand Shore "because I'm not looking for shore birds, cos fantails, they live in the forest".

Sometimes the expectations which developed from reading the title and looking at the cover illustrations were matched and the subject's pleasure in finding an appropriate book was quite obvious. However, not all cover information led to realistic expectations for the information inside. Subject 7 selected a book which seemed to contain bird information. She opened it at random and looked puzzled as she was confronted by pictures of tigers! In all fairness to the publishers, the book did have some information about birds but Subject 7 did not expect to find any information about tigers and the book was rejected after a short search. Subject 23 mis-interpreted the title Black Robin Country and told the interviewer that it was "going to be about the country and it's going to tell you things that happen in the country".

In general children realised that they needed to open books to gauge the contents but Subject 18 was willing to evaluate the information found on the basis of titles alone. She glanced at her questions and declared after briefly opening only one of the books she had selected:

> Well, I've got my types, how birds grow and I've got what sort of birds they are. And I think I've got all of my books here.

Subject 13 was similarly willing to predict the contents of a book from the cover alone, although she seemed to become less certain as she tried to explain why the book might be appropriate. The book's title, Mysteries and Marvels of Birds was taken to mean that the book "tells you what they do in their

life and what's good about them and what's um, how they know how to um, if they injure themselves or....". At this point she turned to the shelf to select another book in silence.

To assess the appropriateness of books, several strategies were used. Seven children promptly turned to the index to hunt for their keywords, two looked for a table of contents and nine looked for both contents and index, although not necessarily in the same book. Subject 12 carried out a random search of each book selected and expressed dismay when faced by a large book:

S12: New Zealand birds ...eek! It's big!
Interviewer: Is that a problem because it's big?
S12: Yeah, sort of.
Interviewer: What makes it, what's the problem about it being big?
S12: It's going to be hard to read all of it.
Interviewer: You won't have to read all of it will you?
S12: Just have to...oh, dear!....It's got all these, it's just got...I suppose it's quite a good book, it's got all the, some of the different birds, or most of the different birds and different things about them.

He was questioned retrospectively on this point:

Interviewer: ....do you usually use the table of contents or the index?
S12: I don't really, I don't know why.
Interviewer: You don't?
S12: No, I don't, I don't really use the contents, I just look for interesting things.
Interviewer: You just look through the pages?
S12: Yeah, you don't really know what you're going to find in the index or contents.

Further discussion showed that he could explain what the index was supposed to do and where to look for his keywords but he did not use this knowledge in information searching.

Four other subjects resorted to random searching but did use contents or indexes sometimes. For Subject 7, failure to find an appropriate entry in the contents of two books seemed to result in abandonment of such aids in all subequent books.

Some children not only failed to find the entries they sought, but failed in some cases to find an index at all. Subject 19 reacted strongly to books lacking an index:

S19: Looking for ah.... index!
Interviewer: Index? Is there one?
S19: No... this is rubbish! (Replaces book on shelf immediately.)

Each time he picked up a book he made comments such as "Wow, this is a good one!" only to reject them as "rubbish" when no index could be found. He in fact found three books without indexes and returned each to the shelf without investigating them further. Two children who had the same experience looked for a table of contents as an alternative to the index and two resorted to random searches of the text.

Information searching using the contents and indexes of some books proved unexpectedly difficult at this point. Four subjects found books which had either a table of contents or an index but inadequate page numbering. A quick post-study survey of the books on the shelf revealed that three BIRD books had a table of contents and no page numbers, five volumes had no contents, no index and no page numbers and three books had pictures which obliterated some page numbers. In one of these, a child searching for page 26 found that the nearest number was 19. Subject 23 pointed out that this sort of book is best returned to the shelf as it takes too long to look through all the pages - "and then they might not have it [the topic sought] and then you'd be pretty disappointed".

Some indexes presented problems to the children because they contained unexpected information. Nine subjects commented that the index was "just a list of" birds' names or towns rather than being a list containing the sorts of keywords they had come up

with. Subject 3 was disappointed that the index did not give HAWKS followed by sub-entries for wings, colours and flying (subject 20 voiced a similar preference for sub-entries) and Subject 2 seemed to think that looking in the index was the end of information seeking. She did not look unprompted at the text in any book and was surprised when, at the conclusion of her interview, she was shown how to look up a particular bird to find out what it ate. She had assumed that because EATING did not appear in the index, the information was not in the book.

Similarly, tables of contents surprised Subject 15. He expected the contents to be alphabetically arranged. This may have been due to a confusion over the location of indexes and tables of contents, something he appeared to share with subject 18. In talking about indexes, Subject 23 proved to be quite definite about the features that make an index easier to use. He prefers those in which alphabetical order is clearly marked, at the very least by having spaces between entries beginning with say A and B. He also commented that some indexes are too long, not just in terms of the time it takes to scan them, but in common with Subjects 9, 10 and 12, the sheer volume of information in some books seemed daunting to him.

Although one can not be absolutely certain, some children did not appear to scan tables of contents systematically. For example, one book, The Complete Book of New Zealand Birds, has two distinct sections to its contents. At least two children who examined this missed the first section about the general characteristics of birds and saw only the longer section on specific types of birds. Thus they missed the information they were seeking despite the fact that both sections appeared on a double page spread. This lavishly illustrated and informative volume was stigmatized as "just pictures" by Subject 3 who did not actually try reading more than the index. Criticism was also levelled at one book organised and visually presented to appeal to children. Subject 13 said "there's not much knowledge in this book - it's too jokey"! She based this conclusion on the inclusion of true or false questions appearing on some pages.

Finally with regard to children's comments about the books themselves, Subject 17 found that the language used in some tables of contents was beyond her understanding. Subject 8 made a similar comment and noted how laborious it is to have to keep referring to a dictionary. Subject 17 was also daunted when faced with a big block of text. In fact she, together with subjects 2, 7, 10, 11 and 22 seemed unwilling to actually read for information.

The above describes the children's strategies for selecting books, whether they sought the contents or indexes to assess usefulness for the task in hand and gives some of their comments about books. Their evaluation of books will be explored in more detail with reference to the keywords chosen for finding information to answer the subjects' original questions.

Selection of keywords for individual book searching

Discussion of the questions the Form 1 children generated for this topic has been deferred until now because the questions, keyword selection and success in finding information are closely bound together. Some questions posed by the children were not researched during the interviews since time was limited but keywords for these were often discussed before searching began.

The children have at some stage been taught to look at their questions for keywords that would appear in the catalogue or in book indexes. Four children carefully underlined words in their questions before moving to the catalogue, while others selected them less formally as they came to search individual books. This often required checking back to the contract sheet to see what the questions were. The children can be grouped by the main source of the keywords they selected to direct the search. The possible keyword sources, whereabouts keywords appeared in books and evaluation of the relevance of material found is summarised in Table 4.

Nine subjects used only words appearing in their questions. Two subjects used words from their questions together with related words that occurred to them. Three subjects appeared to

Table 4

Sources of keywords and their appearance in book organisation aids

Category	n subjects
Sources of keywords	
original questions only	9
original questions plus related alternatives	2
original questions and words recognised as appropriate from reading	4
original questions, related alternatives and words recognised as appropriate from reading	3
specific keywords not appearing in questions	2
no specific keywords in mind	3
Evaluation of relevance of material found	
subject and interviewer evaluation agree	13
helpful according to subject	2
not helpful according to subject	8
not clear from interview	23

Category	instances
Appearance of keywords in book	
contents	19
indexes	16
text	11
not found	27

have no specific words in mind but used words found in the books which they deemed appropriate. (Subject 13 looked down the index of one volume with the stated aim of finding out what sorts of birds were included.) Four subjects directed their search by combining keywords from their own questions with those recognised as appropriate and three subjects moved flexibly between the wording of their questions, related words they generated and words they recognised as appropriate. The remaining two subjects posed general questions then narrowed them down to give specific keywords which did not appear in the original questions. The levels of success of these strategies for accessing information varied with the scope of the question, the keywords selected and the section of the book searched. All strategies seemed appropriate to the task but did not necessarily meet the demands of the individual books. Thus during the recorded interviews information was found to answer only 30 of the 86 questions generated by the children. Five children during this time in fact found no information that the interviewer judged to be relevant to their questions.

To examine the apparent mis-match between keywords and information seeking, one must re-examine the questions from which keywords were selected.

Some of the questions posed by the children were impossible to answer in their original form. A selection is given below:

How long does it take for the eggs to hatch? (No specific bird mentioned.)

What kinds of birds are there?

Where do they live?

Which birds live in hot areas and which live in cold areas?

Which birds can camouflage?

Why do birds live on trees?

Selection of appropriate keywords from within these questions was particularly difficult. For example, Subject 4 was asked how she decided what keywords were:

S4: Well, if you're looking them up in an index... what they'd most likely come under....

A few seconds later she tried to choose a keyword for What is a bird? After a long silence the following exchange took place:

Interviewer: Now have you got a problem?

S4: This is a tricky one, yes I have....Well, look under bird, well if it was a book on birds, to look under bird would be a bit queer. Um,... could be...

Interviewer: So how can you overcome that problem?

S4: Well, I could wipe the question out or...

Interviewer: Would that be satisfactory ... to you?

S4: Mmm, no. I'll keep it, but I've just got to think of another keyword ... um, what is it, I think I'll put. What ...(underlines what, is, and it). Okay.

Interviewer: So you've chosen What is it as the keywords?

S4: Mmm, what is a bird?

Interviewer: Okay. And you want to find those in where? Where are you going to look for them?

S4: Um, in the book...

Interviewer: In the book?

S4: In the index.

In order to answer this question, she later searched the index of one book for BIRD and WHAT IS IT, but held little hope for finding the latter. Her finished work did not include the question. Other children asked the same question and did find relevant information during the interview. In each case they searched the contents, not the index, and found an exact match for "What is a bird?" Thus it would seem that some search words are more appropriate to indexes than to tables of contents. For Subject 4, this was the only question for which keyword selection was difficult, some of the others struggled with selection of each and every one.

Some of the general questions were asked by more than one subject. For instance, "what do birds eat?" was asked by eight subjects. Two of these did not actually search for an answer during the interview but the keywords selected for searching by the other subjects were "eating" (S2 and S9), "feed" (S8) and

"food" (S17). Two subjects had no specific word in mind nor did they recognise one as appropriate during their search. Again, the children looked in different places for matching entries. For example, Subject 2 selected the table of contents, Subject 8 the index, and Subject 9 looked in both then randomly scanned the text. None of them found relevant information, although the interviewer saw an entry for "food" which Subject 8 overlooked. Children who limit themselves to the wording of their own questions or to searching only the index of a particular volume may miss the required information.

One might expect that those children having no specific keywords in mind at all would have difficulty finding relevant information. However, two subjects in this category were quite successful. By scanning the text and indexes they located keywords which seemed relevant to their questions. One of them answered all the topic questions generated during the interview and the another missed only one from his final project. The remaining subject located no information relevant to her original questions.

Four other subjects used specific keywords during their search but had none in mind for part of it. The drawbacks of not choosing a specific search term are illustrated by Subject 10 who commented that the index in one book was "a bit big, it would take too long" to scan.

One might expect those taking keywords from several sources to be highly successful. This was partially true for two of the children who used keywords from their questions, related words and words recognised as approriate when reading. However, the third member of this group found nothing during the interview. In their final projects one answered all his original questions and the others answered just one of them and substituted several new questions.

The situations in which a flexible approach to keyword selection is adaptive will be explored in the discussion.

The final approach to selecting keywords was that of focusing general questions to produce specific keywords. The two

children who gave the clearest evidence of doing this both accessed relevant information during the interview. Their overall success levels in answering the original questions were markedly different because of differences in their ability to "do something" with the information found. Here the distinction between keyword selection and search strategy becomes extremely blurred.

Subject 14 said he knew little about the topic BIRDS and therefore he formulated just one question - what are some birds in New Zealand - as a starting point. He specifically stated that he would use this to discover what sorts of things he wanted to know about birds, maybe how big they are, what they look like and where they live, but he needed to know what birds there were first. He located the books with ease then read a few titles, choosing Birds of New Zealand Rivers, Lakes and Open Country since it appealed to him more than birds of the town. He read the contents and selected the chapter on ducks. After assessing the information in that chapter he announced that he would do his project on ducks, in particular the grey teal. Each following book was then checked for DUCK, then TEAL and GREY TEAL. Each piece of information gained was clearly evaluated and used to direct the next part of the search, for example:

S14: ....(Looks at books on shelf.) Small Birds, I want to see if it's a small bird (looks back to first book which was open).

Interviewer: So what's happening now? Have you seen a title that you think's appropriate and what are you doing?

S14: I'm just seeing if it's a small bird. (Reads.)

Interviewer: Okay, so you've seen a title Small Birds and you're checking the information you've got there to see if it's a small bird?

S14: Yeah...52 centimetres (holds hands apart roughly that distance). That's quite big for a bird. I know it [the book Small Birds] won't have the information. (He did not look inside it.)

At another point he discovered the Maori name for Grey Teal and used that as a search term in the following books.

In contrast, Subject 23 asked "Where do certain birds nest?", "What are bird dangers?" and "What food do they like most?" He then focused on sparrows, fantails and nests to answer these questions. He did not produce a final project although he located each of these keywords in the contents of books and found sparrow in the index of one during the interview. His major difficulty was in reading and evaluating the information found. For example, a caption which read "16 cms, sexes alike, up to 5 broods a season" became "They've got 16 centimetres of accessed, excess aleck aleck whatever they call it, nest or up to 5 broads in a season whatever... I don't understand what they're saying here."

Overall, 63% of the children's search terms were matched in books (the number of books searched before a match was found was not recorded). However, matches often lead them to irrelevant information. Subjects 3 and 9 provide the illustration. Subject 3 had eventually focused on hawks, colours, wings and fly as keywords. He found only a match for hawk but this had several references throughout the book. He carefully checked each one in turn but they yielded little information that related to his questions.

In contrast, Subject 9 found too much information! He chose flight and flying as possible keywords and located what appeared to the interviewer to be an excellent discussion of the prerequisites to flight together with description of how birds fly. After reading in silence for a moment or two he said:

S9: Looks like my word flying isn't a very good one.

Interviewer: (In amazement!) Why?

S9: Well, there's lots of words flying here (points to text).

Interviewer: Because there are a lot of words flying there, you don't think flying was a very good word...

S9: Well, not a key, not a very good keyword for.... (returns to reading text). It tells you how it

flies.

Interviewer: So is that useful to you?

S9: Yep. (Indistinct phrase ending in "questions")

Interviewer: But you didn't think this part here [first column of text on prerequisites to flight] was as useful to you?

S9: Well, no not quite as useful, cos that's just about muscles and things. This is more about um, aerodynamics and how, how the birds lift off.

When discussing this incident retrospectively he said that there were lots of flying words and "flying means a lot of things so I suppose one [keyword] a bit more down to the point would be a bit better...". However, he could not think of one. He later said that flying was a good keyword to find the right place in the book but it was not too good to find the right information in the text. The implication seemed to be that a good keyword is one that accesses the specific information needed by the child and not too much of it!

Frequently the interviewer was able to read the information found by the subjects as they read it, thus allowing her to judge its relevance to the original questions. The children were asked whether the information found was useful and in 13 cases subject and interviewer evaluations of the information coincided. On eight occasions the subjects thought the information found was irrelevant but the interviewer privately thought it could be used, either in the finished project or to guide the information search. In two cases children decreed that the information found was satisfactory when the interviewer thought it was poor. One girl, having generated questions about New Zealand birds and extinction, carefully took notes about African birds near extinction, at the same time verbalising her realisation that the information was not about New Zealand.

Evaluations of relevance are essential to information searching yet some children, particularly Subjects 18 and 19, decided the relevance of whole books on the basis of glancing at

pictures. At least four other subjects seemed reluctant to actually read the text.

In brief, it appears that selection of the "right" keywords is not easy. Only Subject 4 voiced the realisation that they must be the sort of words that appear in indexes and Subject 20 was the only one to specifically state that the best keyword may not actually be in the original question. The relationship between the statement of information need and retrieval of relevant information was apparent to and acted upon by Subject 14 but many of the children need help in reducing questions to something that can be looked up.

The information seeking process

The final section of this chapter deals with a few points about the children's overall approach to seeking information.

Given that the children had just one week in which to complete the project and that they could not complete their information searching and note-taking during the interview, it might be expected that they would note bibliographic details for future reference. The contract form they were using did request a list of references used and could have prompted them on this level but only three subjects noted any authors or titles. Subject 3 said he would remember which book he had been using and Subject 1 thought she would remember because "it's a big book". Thus most children were faced with locating and selecting the books for a second time.

The majority of subjects (16 in all) checked selected volumes for information on more than one question before rejecting or accepting them. However, two subjects searched books for answers to a single question then chose a different book for the next question. This may have reduced their chances of finding relevant information quickly. It is not clear whether the remaining five subjects searched for single or multiple keywords.

In addition, the children were asked whether they had found enough information during the interview to answer at least one question. Thirteen subjects thought they had enough, seven thought they would need more and in three cases such an evaluation was not made. Asked whether they would search in the same way to answer their remaining questions, or whether they would change their strategies, nine of 13 subjects replied that they would continue in the same way and five thought a change of approach would help. These changes varied quite markedly with one subject preferring to go to a different library, another to watch birds in the garden and a third choosing to look up BIRDS in the catalogue instead of ZOOS. (It is interesting to note that her finished project suggests she (Subject 7) did not in fact do this.) Two subjects stated that they would use encyclopaedias to find the needed information. This raises the question of whether other subjects also had preferred information sources within the library.

Although 12 children expressed no clear preferences, two mentioned the learning resource centre (LRC) in general, three mentioned encyclopaedias and six mentioned both the LRC and encyclopaedias. For five of these children the LRC seemed to be synonymous with topic work and each commented that to find information they would go there first. For instance, when asked where she would start looking for information, Subject 20 replied:

> Oh, in the LRC. For a research book.

She did not seem to realise that "research books" were also kept in the library. Subject 11 apparently made a similar assumption. Since he was particularly interested in the topic and quite an efficient information searcher, it was somewhat surprising to discover that he had not previously found the 35 bird books on the main library shelves.

The remaining seven children referred to the LRC and encyclopaedias as alternative resources to be used if they found nothing in the main library. Subject 18 backed up her preference

for using encyclopaedias by saying they are easier to use than the main library:

> ....cos on the books they've got the letters but in the library you've got to look in the catalogue then look for the numbers and you've got to look through it. It takes quite a long time but in the encyclopaedias you just have to open the book, just keep shuffling it around till you find them, your right word.

From this it was understood that finding information on a given subject in the encyclopaedias merely requires one to know the letter it starts with and is thus a more direct method of searching.

This information seeking task presented difficulties to several children but three stated that they definitely would not think of asking teachers or librarians for help. Four said they would ask the librarian but one specified that such help would be sought in a city library rather than the school's. A further three would approach a teacher for help and 13 subjects made no comment about help-seeking.

The data gathered for this study is varied and any summary of it is bound to raise more questions than it answers. Discussion of the issues raised here and their implications for teaching information skills is presented in the following chapter.

CHAPTER FIVE

DISCUSSION

Generation of questions

As noted in chapter one, it is often assumed that children beginning topic work will spontaneously use their existing knowledge to direct question generation and information searching. The topic chosen for the present study was, in Sheingold's (1987) terms, a category rather than a question or problem. Thus the children were forced to use their existing knowledge of the topic BIRDS in an endeavour to transform the assignment into a question driven exercise. However, their knowledge base for this topic was relatively small and this influenced the type of questions they were able to ask.

As Miyake and Norman (1979) point out, expert questioning on a given body of information differs from that of novices both quantitatively and qualitatively. This results from the former's greater ability to assess what is relevant to the topic and what is missing from the information presented. According to Irvine (1985), graduate students need assistance in refining topic questions yet the sophistication of the skills implied is often overlooked in the classroom. Bringing this to the children's level, Kobasigawa (1983) presented 9 and 13 year olds with information about China then asked them to come up with questions for projects based on that information. To repeat, all the older children generated questions whereas half of the younger ones did not. In addition the 13 year olds needed less instruction in narrowing the search area than did the nine year olds.

The children in the present study were generating questions in isolation of information other than their prior knowledge with the implicit goal of using those questions to access information, a task not performed by Kobasigawa's subjects. Their general questions reflect what Beal (1980) refers to as a "hazy conceptualisation of the topic" and this naturally makes selection of index search terms difficult.

Unlike the 11 year olds observed during Project INQUIRE (Sheingold, 1987), the Form 1 children in this study did not seem to have difficulty "grasping the task" of question generation. Some certainly had difficulty thinking of questions, but the majority set questions quite quickly as if the task was not at all novel. Although direct comparison of the two groups cannot be made, it is possible that their educational experiences have led to differences in expectations for questioning behaviours. In which case, cultural effects may influence information seeking performances.

The interaction between question formulation and index searching demands that the characteristics of the database to be interrrogated be taken into account. This in turn assumes the questioner has sufficient knowledge of those characteristics and has the ability to evaluate questions in light of them. The children at this stage appear to have a serial approach to the problem - come up with a question then sort out the keywords. This was apparently done with little consideration of the nature of indexes.

The role of prior subject knowledge in question generation, has been mentioned above, but it is not clear from the present analysis of data whether many children recognised the relevance of the information they held and were able to use it. Further analysis on this level would be valuable.

Finally with regard to question generation, attention will be given to questions substituted for those in the original contracts. Answering the questions set was apparently not the prime goal for some of the children. Sheingold (1987) holds that category type assignments result in children meeting practical goals such as review the right number of resources, write a given number of pages and make an attractive cover. Indeed, the children who presented finished projects met these pragmatic demands adequately, yet 52% of the questions set during the interviews were not answered. One wonders what happens when they have a personal need for information and question substitution is, by their own evaluation, unsatisfactory.

In sum, most of the children in this sample could do with help in formulating questions that are compatible with the demands of individual books and the library's information retrieval system. This aspect of information retrieval will be examined more fully with reference to keyword selection. Suggestions for teachers will be presented in the final summary.

Selection of keywords for catalogue searching

In this instance the children's research topic could only be described by using the word best suited to seeking information about it. The descriptor BIRDS was matched exactly in the library catalogue and was the natural choice for all but three subjects. Two of these used words which appeared in their questions (EAGLES and ENDANGERED BIRDS) and may not have realised that more general terms are sometimes necessary at this level of information retrieval.

Since the topic BIRDS appeared in the catalogue, this exercise did not really test the help required by Form 1 pupils at the systems level. One cannot assume that topics presented in more abstract terms would be as easy to locate. For instance, natural disasters, the eighteenth century and conflict areas (topics which are known to have been given to youngsters as research subjects) all demand the use of more specific descriptors for information retrieval. From the children's questions on the topic BIRDS it can be seen that abilities to both reduce and increase the scope of a topic are necessary to selection of the most appropriate term for catalogue searching.

Beal (1980) implies that a flexible approach to information seeking is essential. Such an approach demands not only some subject knowledge but also knowledge of the various ways in which topics can be organised and represented in classification systems. Given the presence of an exact keyword match in the catalogue, it is unclear from this sample whether the children have begun to develop a flexible approach but it is notable that only one child returned to the catalogue during information seeking to try a totally different path through the information.

Checking the catalogue

As outlined in the previous chapter, before the catalogue can be searched, one must decide which index is appropriate. Most subjects in this group had no difficulty with the fiction/non-fiction distinction but Subject 20's foray into the fiction section shows how disheartening the wrong decision can be. One wonders how long she would have persisted had she not been under observation or if the information was for her personal use only. She gave insight into her interpretation of fiction index cards, an issue not expected to be addressed in this study. She selected the title index but failed to note more than the letter beginning the name of the author. The search that followed suggests that she did not understand the relationship between the information on the index card and the books on the shelf. Was this an isolated event or do other children have difficulty locating a particular fiction item? To complicate matters, fiction and non-fiction resources are organised for shelving in different ways in this and many other libraries. Do adults assume that ability to find fiction items translates automatically to locating non-fiction and vice versa?

In addition, Subject 20 was not prepared to examine the non-fiction subject catalogue to abstract information about its organisation. She merely shut the drawer the instant she saw something "strange". A problem-solving orientation is perhaps not expected of 11 year olds on the basis that they have been or are being taught about the organisation of the school library. However, topic work often demands that these same children visit the public libraries whose catalogues may be organised differently. (For example, Wellington Central Children's Library has a catalogue which integrates author, title and subject indexes for both fiction and non-fiction.) Therefore one may be forced to think about catalogue organisation before information searching can begin. Naturally, one can seek help - a point which will be dealt with later.

But for Subject 20's difficulties and Subject 19's rapid rejection of the catalogue as an aid, catalogue selection and

location of an appropriate entry demanded little thought. The classified section was ignored by all but one subject and this in itself may suggest that its function is not understood. This would not be surprising since most adults (teachers included) are also chary of its use (Avann, 1985).

Turning now to the actual index cards found, it is apparent that children have a variety of ways of interpreting the information presented. Just the number of cards for a given topic was thought by one subject to indicate the number of books on the shelf and this may be a variation of the view that there is one book for each Dewey number listed. This latter view was more widely held since six children later made comments about having found the book with a particular Dewey number. These events, together with the lack of evident understanding of the meaning of Dewey decimal points, suggests that most of the Form 1 children interviewed did not understand the relationship between the information on the index cards and the books on the shelves. This suggestion is in line with impressions gained in Moore's earlier (1988) study but requires more extensive investigation for confirmation.

The presence of several index cards and multiple entries upon them represents a variety of paths through the topic matter to the required information. At this point most of the children were presented with a choice but their lack of subject and system knowledge prevented them making informed decisions. Indeed, only one child overtly referred to her questions and the keywords within them to help her choose. Others may well have done so covertly but several seemed to copy down numbers, locate one of them on the shelves then forget the rest. If a systematic search is to be carried out children must monitor where they are in the search so that they can return to investigate other paths. This seems a tall order for youngsters but it is essential to tracking down information especially when it refers to nebulous subject matter. A few children did follow up more than one index entry and in each case this followed failure to find what they wanted. Their actions may well indicate the development of some

problem-tracking abilities.

Three factors seem to be involved in the confusion caused by the choice of Dewey numbers. Lack of understanding of the system and paucity of subject knowledge have been mentioned as the major factors but what of the format of the index cards themselves? The multiple entry card had a single keyword upon it and no words to help differentiation between the entries 598, 598.2 and 598.29931. Admittedly, 598 appeared on another card but 14 children took information from the first card they saw thus loosing the chance for clarification that would come from examining other cards. As Lancaster (1972) states, the index exists to bring the language of the searcher and that of the indexer in line with each other. If additional words were to appear on such cards they would increase the possibility of matches occurring between the children's keywords and the index terms. At the very least, the thesaurus which was used to help library staff determine the classification of a particular book should also be available to the children themselves.

The advice presently given by the School Library Service is to keep primary school indexing systems simple, to use the general category BIRDS 598 and not use the decimal points (Murison, personal communication). While this policy may be put into practice when new books are catalogued, there is no guarantee that library staff will have the resources to revise the existing system. Consistency of format within the system is a continuing problem, especially where schools have to rely on parents spasmodically giving the task a couple of hours of their time. Building an information retrieval system that meets the needs of a particular clientele demands thorough knowledge of that system and the characteristics of the intended users. However willing people are to give their services to the school, there is no guarantee that they will be able to meet these demands consistently.

In brief, the above demonstrates that understanding index cards can pose several problems for Form 1 children. Although the topic set for the children in this study was easily

identified in the non-fiction subject index, projects allowing greater interpretation of meaning at this level of the search may well demand several search attempts before a relevant Dewey number is located. Thus a problem-solving orientation to information seeking is called for. Here most children experienced success quickly, we do not know how they cope with multiple failures in the early stages of topic work. One can imagine them loosing interest if the information need arose from curiosity alone and not from a formal assignment. It is clear that the majority of these students need help understanding the relationship between the information on the index cards and the books on the shelves if they are to develop efficient information skills.

Location of books

Children's approaches to finding appropriate books on the shelves reflect their interpretation of the Dewey numbers and their perception of the library layout. In several cases it was not until they were faced with the shelving that anomalies in their understanding of the Dewey system became apparent. This is perhaps a reflection of Lunzer and Gardner's (1979) finding that children were often able to explain the theory of finding books but were unable or unwilling to put it into practice! Thus it may be better to assess children's understanding of the library system through information seeking tasks which are integrated with the main curriculum rather than through isolated classroom exercises.

That shelving guides both help and hinder children in locating books was an entirely unexpected finding. It is suggested that in future studies questions specifically addressing this point be included so that the way guides are used is clear for a larger sample. Flexible use of the guides seemed to be lacking in that nearly all users of numerical guides used the first digit to pinpoint the starting position of their search. In this case the collection of 500s was not large enough to be daunting to the child searching from beginning to end but

in a larger collection the presence of shelf guides between those for 500 and 600 would aid efficient searching. This of course assumes that the user is totally familiar with numerical order and can apply greater than and less than concepts to narrow the search area.

The guides seemed to hinder most those children who perceived the library shelves as continuous since they omitted to look at shelves on the next bay which were above the level of the shelf containing the 500 guide (e.g. E and F in Figure 3, page 53). In addition, the library shelving units are generally buff coloured and blend into the array of books. The child looking for information in terms of a book focuses naturally enough on the books, not the shelving bays. Past experience of continuous shelving can add to the illusion as well - one girl commented that shelving was continuous in her previous school library. This prompted a quick check of another contributing school's library. There it was found that both continuous and bay shelving were used indiscriminantly! Therefore it is suggested that one shelving system is used consistently within the library. It must also be ensured that teaching about book location includes clear reference to how the books are actually shelved. In light of Rudduck and Hopkins (1984) finding that library induction lessons were too fast and too far in the past, educators must be prepared to repeat the necessary information frequently and to link it to the children's actual information needs so that the theory can be put into practise. It might be thought that the system of separate shelving bays is beyond the understanding of the younger primary school children, but tuition on this point can relate the width of the shelving bays to body movements of the child - it is a comfortable width to read the titles standing in one place. Obviously this applies to books with titles written on the spines and to the reading child. Collections of books, both fiction and non-fiction, for the very young, need separate consideration.

One might think that children should notice that there is a discontinuity in the sequence of Dewey numbers when they move

from a shelf on one bay to the same shelf on the next, but small libraries are unlikely to have books on every topic and those out on loan add to the naturally occurring gaps in numerical sequence. Thus numerical discontinuity can not be used as a reliable cue for monitoring the location process. The confusion which arose for one child from the presence of both word and numerical guides may be entirely idiosyncratic. However, should the problem prove to be more prevalent, it would be overcome if word guides such as PETS and POETRY had their associated Dewey numbers clearly visible. Raising the visibility of the shelf ends may also be worthwhile.

Eleven children found a small group of mis-shelved books and those who assumed these were the only BIRD books seemed to locate a book with the right Dewey number then switch to reading titles. When they got to the last appropriate title they did not seem to check the Dewey number of the next book on the shelf. Such an action could have indicated that something was wrong since the number was 595 and they had been examining 598s. While numerical discontinuities do occur, it is a more general rule that lower Dewey numbers are to the left of higher ones, not the right. Given that only a third of the children who located the mis-shelved books went on to find the correct section unprompted, it appears that a quick checking strategy would be helpful to many library users.

In the case of the child who stopped looking along the shelf after finding REPTILE titles, a similar Dewey number check may have alerted her to the fact the 598.2 would follow 598.1, that is if she remembered that 598.2 was an additional target number for the topic and if she knew the shelving progression for Dewey decimal points. It is unclear from the present study whether the children did understand how Dewey decimal points are arranged on the shelf.

Often in small libraries those children might be quite correct who assumed that one index card or one Dewey number meant one book on the shelf. Failure to find a book can be interpreted in several ways - it may be out on loan, it may be at another

location or the child may think it does not actually exist. Each interpretation prompts different action and that chosen will depend on why they were seeking the book in the first place. Here a classified index check would clarify which interpretation is most likely to be correct.

Children holding the "one index entry-one book" idea who locate the required Dewey number on the shelf then switch to reading titles will certainly find any additional books as long as the titles are obviously related to their topic. Seven children in this sample expected certain words to appear in titles and although this expectation allowed three of them to reduce the number of books to be examined and two to find many general books, it proved extremely limiting to the remaining two children. If the "one index entry-one book" concept is combined with rigid expectations for books titles, children may find very little information. There are times when the ability to focus attention on one number or one keyword in the title proves to be an extremely efficient aid to information searching but children also need to monitor the effects of a tight focus and adjust it so that information searching can be successful. Knowledge of what the classified index does could help the children check how many books are available on a topic and which words are appropriate to searching titles yet only one child in the group observed indicated having any knowledge of it.

These Form 1 library users were clearly reliant on title and cover information when selecting books for closer examination. One suspects that this and many other observations made thus far would be applicable to adult library users also. The implication for publishers is that titles and cover illustrations should mirror the contents of the book, be it fiction or non-fiction.

The discussion turns now to consideration of other book features which influenced the children in selecting books for information searching.

Gathering books for information seeking

Most children realised that something more than cover

information is required for book evaluation in terms of the material they needed. Only one child (Subject 12) relied on random scanning of volumes. As recorded in the previous chapter, the others looked for tables of contents, indexes or both and in some cases supplemented these with a look at the text and illustrations. However, as noted previously by Miller (1980), not all of the books had these information seeking aids. If the purpose of the non-fiction section of the school library is to provide children with information, then these aids are essential. Yet it may be unfair to expect their appearance in all non-fiction volumes. Some non-fiction is clearly designed to be read from cover to cover, for pleasure as much as for the information gained along the way (e.g. books by Gerald Durrell and James Herriot). Indeed, indexes in such volumes would lead to brief mentions of a topic which are unlikely to answer the types of questions asked by these students. It may also be unlikely that children would spontaneously search the non-fiction collection for something to read for pleasure.

Likewise one can level criticism at those books which lacked page numbers but closer examination of these suggested that the author's purpose in writing the books differed from that of the school library in acquiring them. In each case where page numbers were entirely missing, the author was an artist who had presented beautiful illustrations accompanied by a few paragraphs of facts about the species. The reading level was appropriate to intermediate schools and the amount of information presented was not overwhelming. The author focused on illustrations, the library staff on reading level and overall presentation and the absence of page numbers was overlooked.

In the other cases where page numbers were few and far between, the positioning of illustrations on the page was responsible for the absence of a number. Certainly, the newer books on the shelf did not present these problems but rare is the library that has money to replace all older books.

On the basis of the above, one can argue that the non-fiction collection should be arranged according to whether

volumes are designed to make information seeking possible or whether they are designed to be read in entirety. That is, whether they are REFERENCE or NON-REFERENCE books. This division would be in line with Avann's (1985) comment that "information books" should be organised for information retrieval with contents pages, indexes, bibliographies and clues such as publication dates to aid the user's assessment of their relevance as information sources. Such a reorganisation may well lead to children discovering the pleasures of reading non-fiction as well as increasing their efficiency as information seekers. Certainly teachers and library acquisition staff should check for the presence of these features when evaluating newly published volumes.

The physical layout of tables of contents and indexes needs to be considered also. There was some evidence amongst the Form 1 children that systematic scanning of a contents page does not always take place. This was most clear with regard to one book which had a two part table of contents spread over facing pages. Part one occupied about a third of the left-hand page and part two covered the rest of the two pages. Scanning seemed to begin at the beginning of part 2 or about half way down the second page. No definite reason for this can be given but possibly the children were looking for their keywords and expected the contents to be arranged like an index, one child made comments which support such a supposition. If this is the case, one would not start at the beginning of the contents to find for example, "nesting". Specific questioning on this point is needed to clarify why relevant information was not seen.

The point is that index and contents searching demand different strategies but it is not clear that the children realised this. Indeed, findings from the study by Heather (1984) suggest it is likely that they did not understand the difference between contents and indexes and therefore could not apply different strategies.

It is notable that none of the children had difficulty with alphabetical order and locating the right part of indexes

although one subject (23) commented that the index is easiest to use if it has clearly labelled segments. One problem rarely faced during this set of observations was interaction with indexes with lengthy sub-entries. These have the potential to confuse since a superficial glance may not detect that alphabetical order is being strictly adhered to.

To use the information aids discussed here, one must select relevant keywords and it is to discussion of the children's keywords that we now turn.

Selection of keywords for individual book searching

To get this far in the information seeking process, children have clambered over a number of hurdles inherent in the system and in the books themselves. They may have invested quite a lot of time in the exercise thus far, yet failure to select the "right" words at this stage sets it all to naught.

The match between the wording of the questions and the language found in the contents and indexes is critical. In addition, the words appropriate to contents pages may often differ in their level of generality from those appropriate to indexes. Above it was stated that indexes and contents pages demand different search strategies. Perhaps the contents are best scanned from top to bottom for an exact word match with the intention of recognising other appropriate words. This approach does not work in the index. Here specific words are needed for "spot" searches, alternative words must be generated and occasionally a general scan for recognition of relevant words is also needed. Given that the information seeker has time, this latter can be a sensible approach when little is known about the topic. As Marland (1978) indicates, one function of an index is to reveal the scope, level and detail of a book. It also provides a list of words suitable for searching, not only the book in hand, but other volumes on the same subject. Obviously, ability to use such information immediately for directing the next part of the search is of a high order. One subject in this sample demonstrated clear ability on this level and perhaps

others could also, if the strategies were made explicit in terms of a problem-solving approach to information seeking.

The children relied heavily on their original questions for the provision of keywords and, as Kobasigawa (1983) found, if these contain explicit keywords matching those in a given volume, information retrieval is relatively straight forward. However, many of the children's questions did not yield the type of words which do appear in indexes. Moore's (1987) study found that 9 and 10 year olds tend to use participles rather than nouns to describe subjects. A greater percentage of nouns was used by the Form 1 children but 37% were inappropriate. In addition, children seem to have difficulty coming up with alternative search terms and one wonders whether they should be encouraged to use some sort of thesaurus to help them in this task. Such an aid would have to include related terms as well as synonyms and may be best produced by the children themselves during discussion of the topic to be researched. Suggestions for classroom experiences which may help are provided in the final summary.

There are situations in which selection of keywords from questions alone, from a combination of sources or complete lack of specific keywords, each results in efficient information searching. The adequacy of the keyword source depends on the nature of the material one is searching and one's level of subject knowledge as used in formulating the question. Beal's(1980) comments about hazy conceptualisation of topics making choice of search terms difficult is extremely apt. The efficacy of the search depends on the individual's ability to match keywords to information sources, to see relationships between differing aspects of the topic (thus aiding recognition of possible keywords), to monitor the outcome of the search strategies used and regulate them accordingly.

Selection of "good" search terms in isolation of the information sources was a task attempted by many of the Form 1 children observed in this study. When faced with the actual books they experienced disappointment that their terms were not present. Children seeking information about general

characteristics of birds were unable to cope with indexes that listed the names of species or with tables of contents that organised information according to type of habitat. Apart from the discussion with subjects 4 and 9 about what makes a "good" keyword, questioning did not explore this issue. As an observer, it is difficult to pinpoint the qualitative difference between appropriate and inappropriate search terms. Access to information does seem to be better through the use of nouns but those such as "camouflage", "homes" and "hibernation" proved to be useless while an adjective ("rare") gained access to information about birds near extinction. It would certainly seem that children need help in determining which words are most likely to be appropriate to any given topic.

Having found suitable contents or index entries, children must then evaluate the actual information in the book. This requires location of the required information on the page and evaluation of it against both the original question and the knowledge so far gained. With respect to the first step, Kobasigawa et al (1988) found that when keywords in the question and the text do not match, even 15 year olds do not use the available headings to locate the target information efficiently. Thus the task will probably take more time than either children or teachers expect. In addition, Kobasigawa (1983) found that 9 and 13 year olds differed in their ability to recognise whether relevant information had been omitted from a report and whether irrelevant information had been included. Further, Nicholson (1988) found that 13 and 14 year olds often could not tell which details in the text were most important, yet both these skills are essential to note-taking.

Here, the Form 1 children (10 to 12 year olds) had similar difficulties in that they rejected some information thought by the interviewer to by relevant and accepted some which seemed irrelevant to their original questions. However, it must be remembered that they made these judgements without actually trying to do anything with the information. As in the case of applying theoretical knowledge of the library system and in

selecting keywords, it may be that abstract judgements will be modified in light of the more concrete task of writing the project. Given the interaction between subject knowledge and accurate judgements of relevancy, it appears that in this area too, children need some guidance. Perhaps the difficulties of actually finding any relevant information together with those of sorting out the main points both contribute to children's predilection for copying!

The information seeking process

Finally the discussion turns to consideration of the elements outlined above and views them as a continuous process.

There is a time element involved in topic work which is obviously important to both teachers and pupils but which has not been addressed directly thus far. One gets the overall impression that many of the children were aware of the limitations of time but that they did not realise they could plan their activities to make the most of that available. For instance, only three of them noted the titles and authors of the books they located during the interview and thus most would have to repeat parts of the information search. Perhaps some did not see the interview session as part of the project time - just an isolated event.

Some children needed more time to think of questions, and some may have improved upon their questions if they had had more time for reflection. Further, children who did not view the shelving as a set of adjacent bays took longer to locate the BIRD section than those who were familiar with the system. To recall Miller's (1980) comment, the use of indexes is a laborious task and the children's reading ability also influenced the time taken to find and evaluate information. Some children seemed unwilling to read and so took longer again. Further, this study demanded full concentration for 20 minutes - working independently they may spread their attention across other activities and thereby extend the time needed for finding information. The point is that information seeking is a lengthy task, even for the skilled

searcher.

Many of the subjects would prefer to go straight to the encyclopaedias. These provide high density information in a form designed for information retrieval but it is noted by Heather (1984) that 10 year old students have difficulties using these resources. Given the situation where one is seeking information on a little known subject, encyclopaedias can provide a brief overall view of the topic area and supply a host of words relevant to searching other sources. However, there is no evidence to show that children (apart from those like Subject 14) are aware of such a strategy or that they could use it appropriately. The division of the library collection into the main library and the learning resource centre does enable those with a preference for encyclopaedias to locate relevant volumes more quickly but it could also lead to restriction in the apparent size of the library's non-fiction collection. Some children may well overlook the presence of valuable information held in the main library.

In general, many children did not seem very aware of the information retrieval process as a whole or of the strategies they presently use. Nine out of 13 subjects would continue to use the same methods to finish their search and those who would change their approach nearly all suggested different places to look in the same way rather than a change in cognitive approach.

In sum, the purpose of this study was to discover:

1 what sorts of questions children ask
2 how these are used to access relevant information
3 whether the keywords selected are compatible with both library cataloguing and book index systems
4 whether the library layout and Dewey decimal system allow easy location of information for Form 1 students

and

5 how children evaluate the usefulness of the information located.

Although the number of children observed was small, it

appears that their limited knowledge base leads to general questions which make the choice of index compatible search terms rather difficult. The organisation of the library shelving confused some children and the Dewey decimal system seemed to be understood at a more basic level than that used for classifying the books. Despite the problems that children encountered, few reported requesting the help of teachers or librarians.

With regard to evaluation of the information located, the Form 1 children were found to reject some relevant information and accept some which was irrelevant to their information need. This aspect of the task needs to be clarified further in light of note-taking and the projects produced.

CHAPTER SIX

CONCLUSION

The picture built up during the course of this study is of a task which demands the application of a myriad of strategies dependent on both the step of the research process being dealt with and the materials to hand at that time. The management of such a complex task requires knowledge of the information retrieval process itself so that progression through the task can be tracked and assessed. It also requires a range of appropriate strategies, both cognitive and metacognitive to allow the searcher to monitor and regulate strategy application in terms of information seeking and the demands of the books. Flexibility of strategy application, together with a problem-solving attitude that interprets lack of contents pages, indexes and keywords or entire books in terms of directing the next step of the search, seems to be the hallmark of efficient information searching.

To expect these skills of Form 1 students is to demand a lot, yet a few (like Subject 14) manage the task with ease. Some of the other children can cope with a few of the above skills yet fall down on others. Although ability level was not taken into account in this study, individuals seemed to show varying abilities at different steps of the process. For example, Subject 2 really had difficulty formulating questions and abstracting the information from the text, yet she overtly evaluated each of her questions against the catalogue entries before choosing an entry to follow up. This latter skill seems to be tied to higher level performance and should be encouraged but her other skills did not match it. In contrast, Subject 4 appeared to be highly able and systematic in her approach to information searching, yet she chose WHAT IS IT as a search term for "What is a bird?". As a final example of skill variablility within this task recall Subject 23's performance. He had no trouble focusing his general questions to produce specific keywords which accessed relevant information but he failed to

produce any written work because he could not understand the text. The number of subjects observed here is too small to justify predictions and generalisations but the range of skills to be developed in the course of project work suggests that blanket assessment of the end product ignores most of the learning potential inherent in the task.

This conclusion coincides with that of the information skills lobbyists such as Irving (1985) and Avann (1985). In addition, the analysis of the thinking processes underlying the use of library materials demonstrates that topic work could well be used to foster problem-solving and metacognitive skills.

It is apparent from the foregoing that several levels of assistance are required by Form 1 students in the production of topic work. The intention to explore the nature of the materials they use for such work has uncovered problems inherent in the materials themselves and hinted at perceptual and cognitive processes that make successful use of the materials difficult. At the systems level, children need to know more about the structure and organisation of the library and what that means for finding information. To know what the Dewey decimal system does is not necessarily to know how to apply that knowledge for one's own purposes. At the level of the individual books, children need to be aware of the features that make information retrieval easier. Again, this implies much more than static knowledge of what the table of contents or index is supposed to do. It means knowing something of the relationship between these aids, the text itself and the user's information need. This brings one of course to the user's attempts to extract that information.

People always have a purpose behind their information seeking. During topic work several sub-tasks must be completed and purposes change from identifying to matching possible keywords, from locating them in the text to evaluating what is found in terms of the next step in the process and in terms of the final product. Each purpose demands a different strategy, dependent on which part of the total system is being searched. Educators need to make the differing strategies necessary to

searching each part of the system quite explicit and to tie these to children's information purposes.

With regard to the overall information retrieval process, children need a map to follow so that they can check their route and change direction without getting lost. This implies helping them develop simple methods of checking their progress and identifying appropriate changes in strategy. In addition, they need to realise that information sources are not perfect. Books do lack indexes, contents pages, page numbers and exact matches for their keywords and each of these events has different implications for what must be done next.

Future research should investigate many of the above issues with respect to a wider population. Having identified some information retrieval difficulties in the broad context of the library, it should now be possible to focus upon specific aspects of these and explore them in a more controlled manner. For example, formulating questions on a little known topic is difficult and demands activation of relevant existing knowledge. Educators need to discover the degree to which children are able to do this independently so that the right level of support can be provided. In the classroom, the assumption that children spontaneously activate such knowledge can be tested through general discussion prior to beginning topic work. The ease with which the teacher gets children to list relevant aspects of the topic may give a rough indication of the difficulties involved and the levels of participation may suggest which children are having most difficulty at this level.

Other aspects of children's attempts to retrieve information which need further study include their interpretations of indexing systems, their ability to monitor and evaluate the retrieval process and how best educators can foster a problem-solving approach to information retrieval. In addition, research attention must be given to those aspects of information skills which were not addressed in the present study, e.g. note-taking, integration of information from several sources and writing the final report.

In chapter one, Resnick (1986) was quoted as saying that research indicates that the kinds of activities traditionally associated with higher level thinking are not limited to advanced levels of development. This study has attempted to decribe the cognitive load which underlies independent topic work by examining the materials provided in a library and thus illustrates the truth of Resnick's statement. The complexity of the task should not make educators deny children the chance to try it but if their attempts are to be successful, the children will need much support. Thus the major implication for teachers is that topic work demands much preparation on their part and specific teaching at each step of the information retrieval process. Provision of an information retrieval process map for the children and the requirement that they keep a diary-like record of their activities would allow both pupils and teacher to reflect on the entire process, to compare the process across successive projects and to gain insight into the performance of each child.

APPENDIX 1

INFORMATION AND CONSENT FORM SENT TO PARENTS

Children's Thinking and Projects

Dear Parents,

I have for sometime been concerned by the trouble children have in finding information on their own. Now I am hoping to carry out a study (supervised by Massey University) which will help teachers, librarians and parents to understand the difficulties from the children's point of view.

Mr. Thwaites has given permission for me to observe children in a Form 1 class as they go about finding information for normal class project work. Children, whose first language is English, will be asked to share their thoughts with me and a video recording will be made of what they do. As they watch themselves on video, we will talk some more about thinking. Sadly, there may not be time to see everyone in the class individually.

This study will give us valuable information about the difficulties children experience and will guide us in helping them and many other children. I'd like to stress that children who do take part will not be evaluated in any way - no one will pass or fail - instead, they will be teaching me and hopefully, will have some fun along the way. In addition, their names and the way particular children go about seeking information will be known only to me. Anonymity and confidentiality will be respected and the children's permission to use the findings will be sought.

To register your consent, please complete the form below and return it to school as soon as possible. If you have any questions about this study, please do not hesitate to contact Mr. Thwaites or myself (phone 792-352). The study will begin on June 7th and observations will take 4 weeks to complete.

(continued....)

Sincerely,

Penny Moore

30th May, 1988.

I am/am not willing to let _____ take part in the study of children's thinking and projects.

Signed _____

Date _____

APPENDIX 2

CHILDREN'S CONSENT FORM

Thinking about projects - Research study

I know that what I say and do while being filmed with the researcher will not be made public. Information about thinking gained from my interview will be put in a report but my name will not appear.

I don't mind the researcher doing other reports based on this one, as long as my identity is kept completely private and the information is used to help other children and teachers.

Signed _____

Date _____

APPENDIX 3

CONTRACT FORM USED BY STUDENTS

CONTRACT

NAME: TOPIC:

DATE BEGUN: DATE FINISHED:

QUESTIONS I WANT TO ANSWER:

REFERENCES I USED:

PRESENTATION METHOD:

PUPIL SIGNATURE:

TEACHER SIGNATURE:

EVALUATION:

APPENDIX 4

SAMPLE TRANSCRIPTION (SUBJECT 12)

(..... indicates a long silence, OC is an observer's comment.)

S12 What do I want to know about birds? Um,.....

I Do you know much about them already?

S12 Not really. Um,.... A good question about birds...mmm.....

I What sorts of things are you thinking about at the moment?

S12 Oh... to think of a good question.

OC Hasn't really settled to the task - treating it as a joke at this stage. Very aware of the camera.

S12 .....(laughs) Oh dear!

I You can't think of something, is that the problem?

S12 Yeah.

I Well, what are you thinking about, cos you are working on it, aren't you?

S12 Mmm...A good question..... (laughs)

I Think of a bad questions then.

S12 A bad question.

I Any sort of question.

S12 What do birds eat? (laughs) Shall I write that down?

I Yeah, if you wish to.

S12 (writes) That's too hard.

I What's too hard?

S12 Well, um, um, what what type of climate does a sparrow need to live in?

I What type of climate does a sparrow need to live in? Why's that too hard?

S12 I don't know, cos there's not, you wouldn't be able to find much information on that. So.....

I What are you thinking about now?

S12 Another question um, (laughs)

I Yeah, but what's going to give you that question? What sort of things do you need to think about to get a question?

S12 I need to think about different types of birds and um,...um,

....it's sort of different when you know someone's watching you.

I Is it difficult because we're here?

S12 Yeah. It's not, it's not too difficult but...

I Does the camera bother you, or me or both?

S12 Both really.

I Okay. You'd normally be in class, maybe with some friends. Is it easier to think of questions when you're with your friends?

S12 Not really. It's easier, it's easier when I'm by myself.

I Mmhm...What sorts of things do you need to think about? The question that you've already got, does that make you think of any other questions?

S12 I had one before. Um, why do birds eat what they eat?

I Mmhm, but you're not very happy with that question?

OC He seemed to be watching for approval before accepting it as a valid question.

S12 No, not really.

I Can you tell me why you're not happy with it?

S12 Because you, all you really have to do is put a list of what birds eat.

I But you just said why do birds eat what they eat. Isn't that different to listing?

S12 Oh, I thought you just meant what do birds eat.

I Sorry, I was thinking of the question that you haven't written down. You don't seem to be very happy with that question.

S12 Cos, yeah it's, you can't really tell why birds eat...worms, I don't know...it's quite hard..... I need to find something out about different types of birds. I need to find something about that.

I The different sorts of birds?

S12 Mmm, the different species.

I Mmhm. Are you having trouble turning that need into a question?

S12 Mmm (nods head) Because it'd be a bit boring if you just said what are some of the different types of birds.

I Mmhm.

S12 What are some different types of birds and where do they live?

I Mmhm.

S12 That's a better one (quickly leans forward to write)

I Okay, you've got 2 questions now. How many more would you try to get normally?

S12 Um, about 2 or 3 more.

I About 2 or 3 more, okay. Let's try and get another one and then we'll go looking for information.

S12 Okay.

OC Much more settled now.

S12 It has to be something about where they live.

I It has to be...

S12 No no I've already got where they live. It has to be something about how they live and about the young.... flying or something like that, I don't know. It's quite hard.

I So you're thinking of quite a lot of different things now, aren't you?

S12 (nods head)

I What sort of things are you thinking about?

S12 Sorts of climate they live in.

I Mmhm.

S12 Birds that live on mountains and ... birds that can't fly...flightless bird, didn't think about that one. Um, something about birds that can't fly.

I Something about birds that can't fly?

S12 Or native birds of New Zealand. It's out of those two. I could put them both down.

I Which would be the most interesting to you?... Well, yes sure, do put them both down because you've got time to come back to them later, haven't you? You don't have to choose between them, certainly not at this stage.

S12 (writes) Um, why did I put a question mark there?

I Why are you saying that?

S12 Because it's not really a question.

I Native birds of New Zealand.

S12 Native birds of New Zealand, yeah

I Is not a question?

S12 No, not really.

I Can you turn it into one?

S12 What are some native, what are some of the native birds of New Zealand.

I Okay. What was the other one you had? I've forgotten.

S12 Flightless birds.

I Flightless birds? Can you turn that into a question?

S12 Yeah.

I How?

S12 By putting a 'what are some' ....

I Okay. Let's try and look for some of this information. Where would you start looking?

S12 I'd go to the er....LRC and look it up in the encyclopaedia.

I Okay, now today we're not using the LRC, we have to do it within this part of the library. So, where in here would you go?

S12 I'd go to the non-fiction catalogue .... and I'd find B and I'd look up birds and then get some books.

I Okay, let's go and do that.

S12 Shall I take this [contract and pencil]?

I Yes, if you wish to, that's fine.

OC Straight to A-D drawer.

I Now do try and keep talking, thinking aloud for me.

S12 Trying to find Birds. Birds.

I Do you usually check behind like that to see if there's something else?

S12 Yeah.

OC He looked at the cards behind BIRDS before settling on the first card he had come to.

S12 Protection...I don't quite...um, birds, ah, New Zealand birds (writes down Dewey number) 598.....

I That last number that you've written down [598.29931] can you tell me what it actually means?

S12 Well, it's where you find... oh I don't know about that! Mmm.

I What, you know what that one means, do you?

S12 Yeah, that's the Dewey number, 598.

I Okay, and what does it do?

S12 That's where you find the book.

I Okay, what about this one there, here [598.2]?

S12 Point 2, that's um, still the same type of thing. Except it's just got on the book point 2 as well.

I Okay and what about this one here? The 598.29931.

S12 I'm not sure about that one.

I Okay, fine.

S12 Shall I go and find them now?

I Certainly.

S12 598...598

OC Quickly located mis-shelved section.

S12 New Zealand birds...eek! (takes Readers Digest off shelf) It's big.

I Is that a problem, because it's big?

S12 Yeah, sort of.

I What makes it, what's the problem about it being big?

S12 It's going to be hard to read all of it.

I You won't have to read all of it will you?

OC He opened book at random.

S12 Just have to...oh, dear.

I What's oh dear? What's, what's making you say that?

S12 It's got all these, it's just got...I suppose it is quite a good book, it's got all the, some of the different birds, or most of the different birds and different things about them.

OC Still looking at pages at random

S12 Other names and size, that could be helpful.

I How will you find the answers to your questions? Can you use that book to find the answers to your questions?

S12 Should have been more specific on what are some native birds of New Zealand because oh, I suppose that's okay.

I What's okay?

S12 Oh, my question. I could just list um, not list, draw a picture of a bird and then write something about it.

I Mmm.

S12 This could be helpful, yes. Leave that one, leave that there (puts book aside). 598...(takes another book) Arthur Singer's book of birds.

OC Opens at random and flicks through pages.

I Do you see anything there that helps you?

S12 Well, it's got different types of birds and where they live and it's got pictures of where they live. Like it's got where they live.

I Yes.

S12 And it's got their height and size... I'll just get my questions.

I Okay. Just on the table there behind you.

OC To this point seems to have been using pictorial information more than textual

S12 I see, different types of birds (reading questions) and where they live. Mmm, that (points to book) could be helpful because it's got where they live.

I Mmhm, so how will you use that information?

S12 I'll have to find something about them and where they live.

OC Seems to begin reading text

S12 It's going to be hard.

I What's going to make that hard to find something about them and where they live?

S12 Well, I just think, it's not really going to be that hard but .... oh dear.

I If you can try to put the difficulty into words I can help you later and I can also help some other children cos you're not the only one that has these problems.

S12 Mmm.

I So if you can put it into words it will help me a lot.

S12 It will? Well, how am I going to find more information about (indistinct)

I You want more information?

S12 Yeah, I need more information if I'm going to write about all about these birds. Or I'll have to do quite a few birds if I want to get quite a bit of information...it's not very

clear is it?

I No that's alright, that's fine. I understand what you're getting at I think.

S12 Yeah, well, this is more helpful (reading a tiny bit). It's got where it lives in Central and South America. (Turns to another page at random, brief look) I'll look through the other books.

I Now you're putting that one away. Tell me why you're putting it away.

S12 Because I have to look at all the other books that are here.

I Okay

S12 (indistinct) Um, 598.2 ...it's not here.

I Well, where could it be?

S12 I don't know really, um, ...(looks to left along shelf a short way then sits back, hand to mouth)

I What's the problem now?

S12 Oh, no no, I've already got that book. The one that had New Zealand on it. And I was just thinking, no no I've got it now. Um...(indistinct)

I What just a 598?

S12 Yeah, where are the other books?

I Where are they?

S12 Mmm. Someone's probably taken them out.

I Well, I can assure you they haven't because everyone's been under the same rule, we're not allowed to take them out.

S12 Oh, I see.

I Remember? We said they're all here for you.

S12 (moves along shelving to right of catalogue) They're not going to be over here....(looks upwards) Ah, got it! Point 2, 598 New Zealand. Here it is (takes volume, opens it at random) There's another book here, and that's got.....

I Do you see anything there that's helpful to you?

S12 Male and female, yeah, different oh, both, the male and the female, so that could be helpful. (Flicks through pages glances at cover again then opens at random again) Now, why has it got that there?

I What are you saying? Why has it got that there? What are

you looking at?

S12 Australia wood ducks. It's a New Zealand book.

I You think that we've only got New Zealand birds in New Zealand?

S12 No. No, no I know we've got other birds, cos they come from Australia. They were brought here or they just flew over.

I Mmhm. Now how are you going to use that book to get to the information you need?

S12 I don't know, um,...I really need to find more information about where they live. I've got ah, habitat, yeah that's ... it's got habitat and range, so that'll be helpful to me.

I Do you understand what they mean when they say range?

S12 Where, how far it goes.

I Mmhm.

S12 And out of New Zealand. There's so many books here!

I Does that make it difficult, because there are so many?

S12 No, it's very helpful really, cos you've got more to choose from.

VIDEO ENDS

SUBJECT 12 RETROSPECTIVE INTERVIEW

I When you were thinking up these questions, you seemed to be hung up on the word good. You were not just trying to find a question, you were trying to find a good question.

S12 Yeah.

I Weren't you?

S12 Yeah.

I Now what makes a question good? Cos once I said to you okay, find a bad question, you gave me one like that, quick as anything.

S12 (laughs) Well, it's, it sort of, it can't be too boring or too easy.

I Now what makes it easy?

S12 Well, just having what are some different types of birds,

then you can just list down or where does the sparrow live? And you can just put all the different countries and things - that's too easy. You can't have a yes or no answer.

I Okay, so ...

S12 That's what I think.

I Yes, I agree with you. Are you trying to think, when you're coming up with a question, are you trying to think about the information you'll get and how you'll use the information, what you'll do with it?

S12 Um, first of all I'm just trying to find the information.

I Yes?

S12 And then after I've found it, then I'll get to work with thinking about what I'm going to do with it.

I Okay, so you don't think about the sort of thing you want to do with it before you look for it?

S12 Oh, in a way, yeah I do.

I Yeah, I got the impression that you did, because you weren't happy just to take a list of birds, were you?

S12 No. Because...oh, it's hard to explain. Because um,.....

I We don't normally ask you these sorts of questions do we?

S12 Yeah, yeah, we just go ahead and do it. Um, yeah I did think about how I was going to present it but I, I wasn't really worried about that much.

I Okay, normally when you do a project, on that contract form there is a place there for presentation, do you normally have to fill that in before you start looking for information?

S12 Oh, yeah, why didn't I (indistinct) Mmm.

I You do normally?

S12 We um, put down how we're going to present it on charts or whatever.

I Right, so that's, does that include whether you're just going to make lists or whether you're going to write an essay?

S12 Yeah.

I Does it include that sort of distinction or is it merely I'm going to use charts, I'm going to use overheads?

S12 Yeah

I It's not what you're actually going to put on them?

S12 No

I Okay, fine. Now you came up with a question What are different types of birds and where do they live, and you thought that that was a better question.

S12 Did I say what are the different types of birds?

I Oh, probably you did.

S12 Oh, eek, what are some.

I What are some? You're modifying it?

S12 Yeah because I couldn't say what are different types of birds because I'll have to list, I'll have to draw a picture of, I wouldn't have to draw a picture of them , I'd have to write their name, where they live and I'd have to do that for every single bird in the book. (laughs)

I There are a heck of a lot of birds, aren't there?

S12 Yeah.

I Did you realise that when you started trying to think of questions?

S12 Yeah, I did actually, there are just so many different types of birds all over the world.

I And because there are so many, did that make it difficult to come up with an answer?

S12 Yeah it did. It made it a bit harder because there are so many of them.

I Now let's take this forward a little bit..... [the video recording] Right, just about to get up and go hunting. Can you tell me anything else about thinking about questions for projects? What sorts of things do you try to think about to come up with your questions?

S12 Um....

I It might be easier if you think of a project that you've enjoyed doing, you've completed it.

S12 A project I've enjoyed doing um, um, well we did a project um, a few months ago about um, number systems, numeral systems. Um, about ancient numeral systems and I did it um, I did it on Roman numerals.

I What sorts of things did you have to think about to come up with your questions? Did you think about the things you know already?

S12 Well, I, I thought about yeah, I did think about the things I knew already and I looked them up in the encyclopaedia.

I Do you use encyclopaedias a lot?

S12 Yeah, on projects I do.

I Now you're looking in books here. You went and got your questions again to remind you what they were. You didn't use the index, you didn't use contents, do you usually use the table of contents or the index?

S12 I don't really, I don't know why.

I You don't?

S12 No, I don't, I don't really use the contents I just look for interesting things.

I You just look through the pages?

S12 Yeah, you don't really know what you're going to find in, in the index or contents.

I Do you know what the index is supposed to do?

S12 Well, it, it classifies all the different types of birds.

I Yes, but let's talk about the index in any book. What does it do?

S12 Well, it um, it lists, it lists all the different things in the books. It lists, oh it doesn't list, yeah, it lists um, if it was a book about birds, for instance it would list all the different types of birds on the specific pages and it tells you the page and it...

I You don't think it would have anything in it that would tell you about flight, food and habitat?

S12 Oh, yeah, yeah. It would, I think, it would. If you look round oh H in the index, might tell you something about um, the habitat, where to look for habitat, habitat of birds. And if you looked in F it'd have fly, I don't know, it's quite hard to answer it.

I Okay, if you're going, have you got enough information to begin this project then?

S12 No.

I You haven't?

S12 I don't think so.

I You're going to have to go looking for some more then, how will you do it? Will you do it the same way that you've done it today, or will you change something?

S12 Um, I would look in the encyclopaedia.

I You'd go and look in the encyclopaedia?

S12 Yeah I would.

I Right, okay. You would ignore the rest of those books there? On the shelf.

S12 No.

I You'd use them?

S12 Yeah.

I And you'd use them the same way that you've used them today, or would you do it differently?

S12 Yeah, I'd, I would get them, I'd find a specific part of a book and then I'd start writing about it.

I You'd start writing, okay.

S12 Mmm, well I wouldn't, I do, write notes, take notes about what I've read.

RETROSPECTIVE ENDS

APPENDIX 5

GUIDE FOR INTERVIEWER QUESTIONING

Think aloud interview

Have you looked up anything about birds before?
How will you choose the books?
What word are you looking for?
Did you find it?
Would another word help?
What are you thinking now?
Was there anything there that suggested where to look next?
Does that add to what you already know?
Point to where you're reading please.
What made you put that book back?
What made you keep that book out?
Are you looking for something different now?

Pay special attention to difficulties - try to get the children to explain the problem.

Retrospective interview

How did you come up with the questions?
Is it difficult to think of them?
Were you interested in the subject already?
What did you already know that helped you decide where to look?
What were you reading then?
Do you have a way of reading extra fast ?
What helps you decide which books to take out?
When you don't find what you want in the catalogue or in a book do you decide quickly what to do next or is it more difficult?
What makes it so?
Have you got enough books to answer your questions?

What will you do if you haven't?
Will you look in the same way or change things?

Pick out silences or indecisions that were not explored
in think aloud - What were you thinking here?

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