Children’s Internet searching: Where do they go wrong?

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Introduction

One of the most common uses of information and communication technology (ICT) in schools is using the Internet for research (see Becker, 1999; Lai & Pratt, 2003; Lai, Pratt & Trewern, 2001; Smerdon et al., 2000), yet only limited information is available regarding children’s Internet searching behaviour (Kuiper, Volman & Terwel, 2005). What is clear from the research that has been done is that children are generally not very successful in doing this (Bilal, 2000; Schacter, Chung & Dorr, 1998), and that they use only limited search strategies (Bilal, 2000; 2001; 2002; Large & Beheshti 2000; Shacter et al. 1998; Wallace & Kuperman, 1997). A review by Hsieh-Yee (2001) of children and adults’ search behaviour found that:

Children could interact with the Internet; they did not search systematically; they preferred browsing; and they had difficulty typing search terms, formulating search statements and judging the quality of Web pages. However, all the children felt confident about their Web searches (e.g. Kafai & Bates, 1997; Large et al 1999; Schacter et al., 1998) (p. 172).

Although there is little systematic research on how children search the Internet (Hsieh-Yee, 2001), it is clear that although this is a common use of ICT in the classroom and at home (Lai & Pratt, 2003) children still perform relatively poorly. In order to enable children to make the most of the time they spend searching the Internet for information we need to first identify the problem. How are children searching the Internet, and what is it they are doing that is detrimental to their performance at this?
Lazonder (2000) perceived Internet searching as encompassing two stages: locating a website, and locating information within that website. Each of these stages involved four steps: identifying the search goal, selecting a search strategy, executing this strategy, and monitoring the search (shown pictorially in Figure 1). Lazonder predicted that different levels of expertise would affect searchers’ performance at different stages of the searching task. He tested this with his colleagues (Lazonder, 2000; Lazonder, Biemans & Wopereis, 2000) by comparing the performance of novice and experienced 4th grade (Year 5) students at search tasks of varying complexity.

![Figure 1](attachment:diagram.png)

**Figure 1.** Process model of information searching on the WWW (adapted from Lazonder, 2000, p. 327)

Based on their model Lazonder and colleagues (Lazonder, 2000; Lazonder et al., 2000) predicted that experienced searchers would be better at the first stage of the task, locating the site, but not the second. This was indeed what they found. When they
explored the difference in locating the site further, they found that experts were better at the first three steps, identifying the search goal and selecting and executing the strategy, but not at monitoring the search. This suggests that the effect of experience is perhaps not as clear as they first thought. Even experienced searchers had difficulty with monitoring their search both when they were looking for a site and when they were looking for information within the site. It would appear that the model cannot fully explain all differences and shortcomings in searching, and that both locating information within a site and aspects of locating the site are influenced by something other than Internet searching experience. The other common way of exploring Internet searching behaviour is through looking at the range of skills and types of knowledge required to be successful at this task. Given the shortcomings of Lazonder’s (2000) model, perhaps identifying the skills required to search the Internet may be a better model through which to understand children’s Internet searching behaviour, and their shortcomings in searching tasks.

A number of researchers (e.g., Nachmias & Gilmad, 2002; Spink, Bateman & Jansen, 1999) have identified a variety of skills or knowledge that are required to successfully search the Internet. These skills can be divided into three categories, each including a range of skills necessary for searching the Internet.

*Search skills/knowledge of process*

Search skills are those necessary to search for information using the Internet or any other media. They include the ability to identify research questions (e.g., Eagleton & Guinee, 2002; Schacter et al., 1998), formulate queries and conduct searches, revising where and as necessary (e.g., Bilal, 2001; Large & Beheshti, 2000), and knowing how and when to expand or narrow topics of interest (e.g., Eagleton & Guinee, 2002). They also encompasses the knowledge necessary to synthesise and evaluate the information found, taking into account such factors as the author of the work and their credibility (e.g., Eagleton & Guinee, 2002; Schacter et al., 1998).
System skills/knowledge of system

Searching the Internet requires specific skills and knowledge. Students must understand how the different search engines work, so that they can make a good choice of which search engine or engines to use, and can also make effective use of it (e.g., Bilal, 2001, 2002). This includes knowledge such as the type of search to undertake, the use of Boolean logic, and whether or not the search engine they are using support natural language or the use of punctuation (e.g., Bilal, 2000; Bilal & Watson, 1998).

General skills/knowledge

In order to conduct searches effectively, students have to know how to use a computer. If they choose to use keyword searching they also need to spell keywords correctly, and to have the reading ability to read and understand the results (e.g., Bilal & Watson, 1998; Fidel et al., 1999). They may also need knowledge of the area in which they are looking for information, so that they know what words will be effective keywords to use, or in which subject category they should look (e.g., Bilal, 2000, 2001, 2002). At least some knowledge of the topic will also aid them in determining which of the sites presented in the results page are likely to give them the information they need.

The current study

In order for children, or indeed anyone, to search the Internet effectively, they need to have skills in all three areas. Although previous research has allowed the necessary skills to be identified, there is still little knowledge as to in which area children lack appropriate skills, or whether a skills based explanation of Internet searching is more effective than Lazonder’s (2000) model. The current study aims to address this, by providing a fuller picture of how children are searching for information on the Internet, and what factors affect their level of success at this.

A number of researchers (e.g., Bilal, 2000, 2001, 2002 and Schacter et al., 1998) have found that students’ performance differed depending on the type of task. Tasks were
either well-defined, which involved students looking for specific information (such as the lifespan of alligators) or ill-defined, with students looking for information on a given topic (such as ways of preventing crime in California). Generally students performed best on the ill-defined task. In line with this, students in the current study were also asked to perform two tasks, one well-defined, and one ill-defined. Students were not, however, asked to complete the same tasks. This is because it was expected, based on previous research (Lai & Pratt, 2004) that most students would use the Google search engine. One of the features of this search engine is that it ‘learns’ what people are looking for when they enter search terms. It does this through the criteria it uses for ranking sites (and thus determining what order they will be presented in) is taking into account what pages have been entered from results pages by searchers using the same keywords. For example, in my previous research most students entered the word ‘kiwi’, with the results being largely about people, rather than the bird they were looking for. By the time several children had completed this task, the sites containing the pertinent information were being presented at the top of the first page of results when the word ‘kiwi’ was used. Due to the quickly changing nature of results, because of the nature of Google, video capture software was used. This software records all actions/sounds that occur on the screen, including cursor movement, and allows the researcher to replay the actions of the students and evaluate their decisions in much greater detail than is possible when simply observing children.

Method

Year 4 and Year 8 students at two Dunedin schools were invited to participate in the research. Once informed consent had been gained from them and their parents, students participated in two web-searching tasks. A researcher visited the school and each student spent up to 25 minutes on one well-defined and one ill-defined searching task, with the order of the tasks counterbalanced. The tasks were developed based on those used previously in this type of research, and from the results of brainstorming sessions. They were tested before use, both to ensure that students understood them, and also that answers would be available, but not too easily. Table 1 shows examples of the tasks used. Tasks were randomly assigned to students, and were the same for both Year 4 and
Year 8 students. All the onscreen actions of the students, and the information made available to them, were recorded via a video capture software package for later analysis.

Table 1: Well- and ill- defined tasks used

<table>
<thead>
<tr>
<th>Well-defined tasks</th>
<th>Ill-defined tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imagine your family is planning a holiday to Kingston, New Zealand. Search the Internet for answers to these questions.</td>
<td>Imagine your family is planning a holiday to Kingston, New Zealand. Find some information that you might want to know.</td>
</tr>
<tr>
<td>1. Where can you stay?</td>
<td>1. Why are they called kiwi?</td>
</tr>
<tr>
<td>2. What can you ride on while you are there?</td>
<td>2. What are three kinds?</td>
</tr>
<tr>
<td>3. How much does the ride cost?</td>
<td>3. Where do they build their nests?</td>
</tr>
<tr>
<td>Use the Internet on the computer to search for information about birds called kiwi.</td>
<td>Use the Internet on the computer to search for information about birds called kiwi.</td>
</tr>
<tr>
<td>1. Why are they called kiwi?</td>
<td>1. Why are they called kiwi?</td>
</tr>
<tr>
<td>2. What are three kinds?</td>
<td>2. What are three kinds?</td>
</tr>
<tr>
<td>3. Where do they build their nests?</td>
<td>3. Where do they build their nests?</td>
</tr>
<tr>
<td>Use the Internet to find out where these cats live and what they eat.</td>
<td>Use the Internet to find information about snow.</td>
</tr>
<tr>
<td>lions tigers jaguars</td>
<td>lions tigers jaguars</td>
</tr>
<tr>
<td>cheetahs panthers leopards</td>
<td>cheetahs panthers leopards</td>
</tr>
<tr>
<td>What is/are the names of six new planets discovered outside our solar system?</td>
<td>Use the Internet to find information about planets outside our solar system.</td>
</tr>
<tr>
<td>You find some seaweed on the beach at St Clair. What kind of seaweed is it likely to be?</td>
<td>Use the Internet to find information about seaweed that you might find on the beaches around here.</td>
</tr>
</tbody>
</table>

Findings

Four Year 4 students completed the questionnaires (two male and two female) and an additional female student subsequently completed the web searching tasks. One student
reported never searching for information on the Internet at school, while the other three reported doing it some days. They used it more frequently at home, with one student reporting doing this occasionally, one on some days, and two reporting doing so most days. Three students reported they were good at using the Internet, with the remaining student reporting he was very good at doing this.

The six Year 8 students who participated were all female, attending an all girls’ school. They all searched the Internet at least occasionally at home and school. Three reported doing this most days at home, with it less frequently done at school. They all considered themselves to be at least average at using the Internet, with two rating themselves as good and two as very good. These students had learnt about using search engines as part of an ICT class in their school.

As Table 2 shows, no Year 4 students correctly completed either the well-defined or ill-defined tasks. They also seemed to perform similarly on the two types of tasks, in contrast to previous findings. In contrast, three Year 8 students correctly completed the well-defined task, while two correctly completed the ill-defined task. In terms of individual performances, one Year 4 student partially completed both their tasks, one didn’t complete either task, and the rest partially completed one task and failed to complete the other task. Similarly, one Year 8 student correctly completed both tasks, one failed to complete both tasks, and the others completed one task but not the other.

Table 2: Students’ performance on the tasks

<table>
<thead>
<tr>
<th></th>
<th>Year 4</th>
<th>Year 8</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>well-defined</td>
<td>ill-defined</td>
</tr>
<tr>
<td>Correct answer</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Partial(ly) correct answer</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Incorrect or no answer</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>
Students’ actions were examined to determine whether or not students failed to complete the task because they did not search in a way that resulted in the necessary information being presented to them, or because they failed to notice the appropriate information, or a page that looked likely to have the appropriate information on it. Table 3 shows the results. From this you can see that only one student, at Year 8 level, missed no information in their search. Even as Year 8 students successfully completed tasks they failed to take note of relevant information along the way. All but one of the Year 8 students missed the information for both of their tasks, with only one not missing a link on a results page. Generally fewer Year 4 students missed information or links on the results page, although all but one student missed a results page link for the ill-defined task. Few students at either Year 4 or Year 8 missed internal links; this is largely because there were few relevant internal links in the sites they visited.

At an individual level, each Year 4 student missed information of at least one type, with one student missing two types of information on one task. All Year 8 students missed two types of information on the ill-defined task, with four missing two type, one three types and one no information on the well-defined tasks.

Table 3: Places at which students failed to notice appropriate information

<table>
<thead>
<tr>
<th>Missed</th>
<th>Year 4 well-defined</th>
<th>Year 4 ill-defined</th>
<th>Year 8 well-defined</th>
<th>Year 8 ill-defined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>The information/answer</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Internal links</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Links on results page</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

Given the information that was missed, it is clear that although no Year 4 students completed any of the tasks, the results of their searching could have lead them to the information for which they were looking. The information they were looking for was either in a page they had visited, or there was a link to a page in their search results that
would have had the appropriate information. Three of the Year 8 students had completed the well-defined tasks, with two of the remaining three students having found the answer, or links to a page that would have contained the answer, but did not identify it, during their searching. With regard to the ill-defined task, all Year 8 students who had not completed the task had found the answer, or links to a page that would have contained the answer, but did not identify it.

**Discussion**

In line with previous research, students did not perform particularly well on these searching tasks. However, examination of the results shows that it was not the mechanics of searching that seemed to be the problem. All but one student at either year level had navigated to a page containing the information for which they were looking (either a website they visited or a results page for one of their searches), which suggests they were able to identify appropriate search terms. Instead, the problem these students had was identifying the correct information within the site. This would seem to fit Lazonder’s (2000) model, which divided searching into two stages: locating the site and locating the information. However, many of the students did have trouble with locating the site, albeit not with the mechanics, but rather with the identification of it as the correct site. This would seem to lend itself to a skills based analysis of their performance. As mentioned in the introduction, three types of skills were identified. This research shows that, although there were areas that could be addressed in all three types of skills, the main problem occurred with the search skills.

*General skills/knowledge*

Students generally appeared to have the general skills necessary to complete this task. They were relatively proficient at using a computer, and only had problems when uncommon events occurred, such as the appearance of ‘popups’. They generally navigated around the browser, finding the homepage etc., without prompting. The students generally solved the problem of not being able to read some of the more complicated pages by simply exiting from them, and although they sometimes had
trouble spelling words, they all seemed used to choosing Google’s suggested spelling on the results page.

System skills/knowledge of system

The students also showed some level of proficiency at using the search engines, although they generally used only one search engine. The one student that used another search engine (Yahooligans!) did not seem to understand the difference between directory-based and spider search engines, and the types of information they are most suited to. The Year 8 students had done a unit on using the Internet, which was apparent in their use of Boolean logic, the advanced search, and the ‘pages from New Zealand’ buttons. However, they did not usually use these options in an optimal manner, and seemed to be using them because they knew they should, rather than because they understood the reasons behind using them. For example, students would use quote marks to indicate a phrase, but put them around only one word. Similarly, a student used the advanced options, but simply put three words in the ‘Find webpages that have all these words’ box, which had the same effect at typing in those words in the standard search box.

Search skills/knowledge of process

Students had more difficulty with the generic search skills required for this task. They were generally proficient at formulating the queries, conducting the searches and revising them as necessary, as was shown from their ability to locate websites containing the required information. They were less proficient at identifying the research questions. This was done for them in the well-defined tasks, but in the ill-defined tasks most students appeared unsure of what they were looking for, and asked the researcher if they had the answer. They also showed very poor skills in terms of knowing how to synthesise and evaluate the information they found. Not one student questioned the information they found. They generally recognised if it was on a different topic to what they expected, but if it was on the right topic then they did not question the information, even when they thought it was wrong. One student, for
example, when searching for information on how the kiwi got its name came across a page that talked about how a donkey got its name. The page starts with the sentence: Kiwi is the sleepy donkey. Although the student said that this was not correct, she still gave it as her answer.

It would appear then, that although there is room for improvement with regard to students’ general skills and system skills, the area that needs most work is their search skills. These are the generic skills that apply to searching all media, so it would be interesting to determine whether students face the same issues when searching other media, or whether they are simply failing to apply the skills they use with other media to the Internet.

The Internet is here to stay, and students will continue using it for research. Although this research is only exploratory, with a small number of students involved, it identifies some areas where students require help, as well as indicating areas for further research. Given the frequency of use of the Internet to find information I feel it is critical that we understand what students are doing and why, so that we may use the information to develop strategies for improving their Internet searching performance, and as this research indicates, their information searching in general.

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References


