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# Abstract

***Purpose***

Numerous studies have highlighted how important web search is to most web users. Yet research also shows us that the majority of web users remain dissatisfied with their web search experience.

Numerous studies have been conducted on the behaviours and experiences of different groups of users as they conduct web searches. Studies to date have typically used graduate students or knowledge workers as research subjects.

This research investigates the web search experience of a 6 year old child. The paper draws comparisons with similar research conducted on older children and discusses implications for future research.

***Research design***

The research participant was asked to complete two web based information retrieval tasks, using two different search engines. Web navigation metrics and an open ended discussion were used to measure and evaluate the participant’s experience with the tasks.

***Findings***

No significant differences were found between the child’s experience and outcomes on the two search tasks. Similar research has reported that children have better success with search tasks on topics of their own choosing rather than on topics assigned by the researcher. This study does not support that finding, but the small sample size here limits the weight of these results.

***Value***

This study extends the work of other researchers by looking specifically at a research subject in an age range that has to date had little mention in the literature.

The study is limited by the small sample size, and suggestions for further research in this area are presented.

# Introduction

The experience of information retrieval has seen a paradigm shift in the last ten years. The World Wide Web continues to expand exponentially as a repository of information on virtually every conceivable topic. The ability to use and effectively search this information repository is becoming an increasingly important skill.

There is a growing body of literature about how people are using the internet for their information retrieval needs.

Hsieh-Yee (2001) provides a comprehensive overview of studies conducted on this topic between 1995 and 2000. Hsieh-Yee reports that studies have looked at a number of different aspects of information retrieval: Web interaction and navigation patterns; type of search task; cognitive abilities of the user; search result organisation and display.

White (2007) conducted an extensive longitudinal study into behavioural variability in web search and discovered that users employ a variety of different strategies to satisfy their information retrieval goals.

Kobayashi & Takeda (2000) present information about how important web search is to most internet users, claiming that 85% of survey respondents rate web search as one of their most important online activities. Yet Kobayashi & Takeda also report that many users remain dissatisfied with their web search experience. Commonly cited problems with current web search engines include: Poor quality of results; sheer number of results; and lack of relevancy of results.

While studies such as White (2007), Hsieh-Yee (2001) and Kobayashi & Takeda (2000) have provided very useful insights into the variability in search behaviour and search strategies that users employ, the studies did not focus specifically on younger web users. These studies tended to focus on graduate students and knowledge workers, or used web log analysis for which the age of the web user is not available.

Research into the internet information seeking behaviours of children has been conducted over the last ten years or so (Bilal, 2002; Ford, Levy, Madden & Millar, 2006).

Bilal (2000, 2002) investigated the search experiences of high school aged children (10 – 15 years). Bilal was interested in behavioural variability in how users approach web search tasks and used “think aloud” techniques to study children’s cognitive processing as they conducted search. Bilal’s longitudinal study is extended by the work of Ford et al. (2006) who also used “think aloud” techniques and a variety of search tasks on children aged 11 – 16 years.

No studies to date, however, have looked at the web search experience of primary school aged children (aged 5 – 10 years).

This paper hypothesises that children are becoming more familiar with internet use and web search at an increasingly young age. This research studied the web search behaviour of a 6 year old child.

The participant performed two search tasks, against two different search engines. The paper presents web browsing metrics, “think aloud” statements, and discussion based on a brief questionnaire about the participant’s search experience.

Internet information retrieval will continue to play an increasingly important role in the educational context and in the home context, for more children, of younger ages over the coming years. This research will form a useful component in our understanding about how to maximise the web search experience for these children.

# Research Questions

This research attempted to answer the following questions:

1. Is the web search experience of primary school children similar to that reported for college children?
2. Do child specific search engines have benefits for primary school aged children?

# Research Design

***Objectives***

Bilal (2000, 2002) and Ford, Madden, Miller and Levy (2006) have employed both quantitative techniques (web navigation metrics) and qualitative techniques (“think aloud” tasks and questionnaires) to analyse and measure the search behavior of children on a number of different information retrieval tasks.

This research used similar techniques to Bilal and Ford et al. to investigate the search behavior of a primary school aged child (6 years of age).

***Setting***

Most of the research to date has been conducted (for specific reasons) in an educational setting (for example, Bilal (2000, 2002) and Ford et al. (2006)).

This research study was conducted in the home environment of the participant. This setting was chosen as it was the most familiar computing environment for this participant.

It seems reasonable to assume that children will employ similar search behaviours and strategies in the school and the home environments, but this may be dependent, as Ford et al. (2006) point out, on the input and guidance they might receive from adults (teachers and parents) and peers, while they conduct their searching.

***Procedure***

The research participant was asked to perform two web based information retrieval tasks using two different search engines. One task was related to a topic of the participant’s own choosing; the other task was related to a topic provided by the researcher. The participant performed these same two tasks using two different search engines: Google (<http://google.com>) and AskKids (<http://askkids.com>). These two search engines were selected as they represent the most widely used general usage (or *adult* search engine) and a commonly used child specific search engine.

An observer was present throughout the search sessions and the participant was encouraged to “think aloud” as they performed each task.

The researcher assigned task was to answer the following question:

*What is the largest type of dog?*

The participant chosen task was to answer the following question:

*How many bones does the human body have?*

***Measurements***

The observer recorded key information related to the browsing activity (number of mouse clicks to complete the task, browsing actions, time taken, successful completion of the task, task abandonment). An attempt was made to interpret this data using a simplified version of Bilal’s (2002) *Web Traversal Measure*.

It is important to note that each search task was deemed to be completed when the participant was satisfied that they had found the information they were seeking (or chose to abandon the task). It was not important for the participant to have found the “correct” answer to the task.

A brief discussion was had with the participant after each search task. The discussion was based on a series of questions designed to elicit the participant’s thoughts and experiences of using the two search engines for the two different search tasks.

***Limitations***

Bilal’s (2002) *Web Traversal Measure* may prove to be a valuable instrument for comparing standardized metrics of web browsing behaviour, but due to the small sample size used in this study, the data reported here could not be analysed with any degree of confidence using the measure.

The qualitative data captured here, in terms of the “think aloud” statements and the participant’s responses to the questionnaire and the subsequent discussions, do represent the actual experiences of that participant. This data too, should be treated with a degree of caution when attempting to generalize to similar aged peers, but it is a worthwhile insight into the experience of one child.

Clearly, further research using larger samples would be required to improve the level of confidence in generalizing these findings.

# Findings

***Researcher assigned search task***

Using Google to answer the question “*What is the biggest type of dog?”* the participant typed this exact phrase as their initial search query. 12 million results were returned. The first search result was selected and the web page visited. After scanning and reading aloud some of the text found on the result page for approximately 5 minutes, the participant could not locate the answer to the search task.

The participant seemed unsure what to do next. He eventually returned to the Google result page (by using the browser back button), and selected the second link in the result list. Again, the participant scanned the text on this page for a number of minutes before declaring “I can’t find the answer here either.” He again returned to the result page and selected the third result, but again could not locate the information he was looking for. The participant abandoned the task at this point, saying “I give up. I can’t find the answer.”

The participant spent 18 minutes on this task, viewed 3 result pages in total, and used a total of 5 mouse clicks. The participant was not able to find the information they were looking for.

Using AskKids to answer the same question, the participant was initially intrigued to see an image of a dog (coincidentally) on the AskKids homepage. “Is this search engine just about dogs?” the participant asked.

The participant again started by typing the question, exactly as it was put to him, into the search engine. No results were returned. The participant seemed a bit perplexed and asked “What do I do now?” and then said “I know, I’ll just click ‘search’ again.” The participant then clicked the search button again (the same query text was still in the input) and this time 3 results were returned (AskKids sets a cookie that is used to automatically augment subsequent queries). The answer to the question was visible in the précis of the first result. Even though the participant scanned the précis text (reading some of it aloud), he did not notice that the answer to the question was contained therein. He clicked on the result link and quite quickly found the answer in the body text of the result page.

The task was completed in 5 minutes and took just a single mouse click from the search result list.

***Participant chosen search task***

The participant chose to find information to the following question: *How many bones does the human body have?* This is a topic of interest that the child is learning about at school. This question was formed with some input from the researcher in order to shape a question for which a discrete answer was likely to be found. The participant initially thought of a topic of interest (“the human body”) and, with guidance, narrowed the topic down (“the bones in the human body”) until the specific question was arrived at. The exact wording of the question is as stated by the participant.

The participant first used Google to find the answer. Using the question exactly as posed as the search query returned 2.6 million results. The participant did not pause to read the précis of any of the results, instead clicking directly on the top result in the list. The first result page arrived at contained the answer in the first paragraph of body text, but the information was presented somewhat indirectly (comparing the number of bones at birth (300 – 350) with the number at maturity (208); fusion of small bones reduces the number). The participant scanned this text for approximately 3 minutes before stating, “Is it 300 or 350?” The researcher replied, “Do you think you have the answer?” The participant responded, “Well, I think it’s 300 or 350, that’s the answer.” This concluded the search task.

The task was completed in 6 minutes and took a single mouse click from the search result list.

Using AskKids, to repeat the same search, using the exact same search query, returned no results. The participant then repeated the earlier strategy of simply clicking again on the search button. Again, no results were returned. The participant stated, “That’s funny, it worked last time when I clicked it again. I’ll try it again” and submitted the search for a third time. Again, no results were returned. “Well that’s funny,” the participant said, “I already know the answer, but AskKids doesn’t even know it!”

At this point the researcher asked “What can you do next, to see if AskKids has the answer?” The participant replied, “Well, clicking it doesn’t work, so I don’t know”. The researcher asked “Is there anything you could change before you click it again?” “Well, maybe I should just use Google again”, replied the participant, “I can’t find the answer here.” The task was effectively over at that point. The participant had spent 4 minutes on the task and did not find the information they were after.

# Analysis and Discussion

One of the questions this research sought to answer was “*Is the search experience of primary school children similar to that reported for college children?”*  One of the key findings from studies on older children is that they typically have better success at search tasks on topics of their own choosing. When viewed in relation to this similar research, the findings presented here are somewhat ambiguous. On the researcher assigned search task, the participant had no success at finding the information using Google, but had quite quick success using AskKids. On the self chosen search task, the participant had quick success using Google, but no success using AskKids.

It is probable that the results presented here are confounded somewhat not only by the small sample size (single research participant), but also by the limited number of search tasks undertaken. It is likely that the AskKids index of searchable content is of a magnitude smaller than the Google index and it seems that AskKids simply did not have a search result indexed for the query “*How many bones does the human body have?”*  A larger range of search tasks would be required in order to mitigate the confounding influence of this.

It is interesting to note the automatic search augmentation functionality of AskKids (as evidenced by the search task *“What is the biggest type of dog?”*)*.*  This functionality worked well for the participant in answering this query (by submitting the same query a second time), but it is arguable whether this is, in the long run, beneficial for helping children advance their searching skills. The participant believed that this was all that was necessary to repeat a search if at first no results were returned. But this strategy is not successful for all search queries (as evidenced by the query “*How many bones does the human body have?”*)*.*  The participant was clearly confused as to why this strategy did not work in that case and did not think to alter the text of the query before trying the search again.

Clearly, a more cognitively advanced web user will quickly learn that altering search query text is the best strategy for optimising their search results, but child specific search engines, such as AskKids, could do more to inform the child about how to approach this important facet of web search. It is interesting that the participant in this study, when unable to find the information on AskKids, suggested returning to Google where they felt they had more success.

Discussions with the participant at the completion of each search task revealed a degree of indifference as to which search engine had best met their information needs and which was the easiest to use. When viewed in light of the actual success (and lack of) on the search tasks, this indifference is perhaps not surprising. The more graphical interface of AskKids (as compared to Google) was appealing to the child but enjoyment of this search interface was offset by the confusion caused over the (seemingly) erratic behaviour caused by repeated clicking of the search button.

The other question this research sought to answer was *“Do child specific search engines have benefits for primary school aged children?”*  This research finds that the answer to this question is “It depends”. A search engine is only as good as the size and quality of its index. AskKids was not able to provide an answer to a search query chosen by the participant in this study. The participant felt that more success was possible with Google.

It is interesting to note that even though the participant could not find the answer to the researcher assigned question using Google, the answer was in fact available on the first result page – just not in a format (i.e. the language used, and the visual presentation) that was accessible to the child. This suggests that child specific search engines may be beneficial if they compile their indexes with quality result pages that are written and formatted specifically for children.

This study used only a single child specific engine; the findings are thus somewhat limited. AskKids was not found to have great benefit for the participant in this study, but it seems likely that child specific engines, if well conceived and implemented, could prove useful.

# Future Work

The research presented here augments existing studies on children’s web search behaviour. It focuses on an age group that has to date had little focus in the literature.

Further research is required using larger sample sizes and a larger range of measurement instruments. More focus on the cognitive experiences and thought processing of children in this age group as they engage in web information retrieval, will help reveal what search strategies are used in what contexts and how these strategies evolve with maturity cognitive ability.

A body of research exists demonstrating the effectiveness of a number of search optimisation techniques for adult searchers and knowledge workers (for example, personal profiling, ontological profiling, contextual relevance, etc). Research on the application of these techniques to children’s web search is currently scarce in the literature and opportunities exist for further study in this area.

Information retrieval will continue to be increasingly important for children of today and tomorrow, in the home environment, in the educational context and in their socialization. I believe that further research in this area will be worthwhile and will help inform strategies that seek to optimize the web search experience for this important age group.

# Research Learnings

Research on children can be tremendously rewarding, but it is not without its challenges. A child’s ability to focus on the research task at hand and to not be distracted by extraneous factors might prove, in some cases, to be limiting factors in the ability to analyse and generalize from the research results. Careful research design is critical in order to isolate confounding variables and to focus with confidence on the tasks being measured.

It is also very important to identify search tasks that are appropriate for the age group being studied. This study was conscious not to make the search tasks too easy, because the research goal was to study the child’s behaviour and to listen to the child’s experience as they approached a slightly challenging search task. A task that was too easy would not have provided much in the way of valuable insights. As it turned out, the tasks turned out to be one of two extremes: Two of the tasks were completed quite easily and quickly by the participant; two of the tasks were abandoned incomplete.

In this study, the role of the observer was very important. The observer, in fact, was not particularly experienced in this role and it proved valuable for the observer to have some “trial runs” to become more fluent with capturing the chosen metrics and recording any thoughts or questions uttered by the research participant. It was important also, to have a clear list of what metrics (the actual browsing behaviours, mouse clicks etc) were to be captured. It is probable in fact, that there was not complete accuracy in the capturing of this data during the search tasks and this underscores the importance of having experienced observers (and preferably more than one) performing this role.

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