



## COVER SHEET

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# **TEACHING USERS HOW TO FIND THAT NEEDLE IN A HAYSTACK: Enabling end user information literacy.**

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## **ABSTRACT**

Information literacy programs must emphasise that the key to effective searching lies in four basic processes, planning, acting, recording, and critically reflecting. Importantly this includes reflecting on what has been retrieved and the searching steps undertaken. It is this reflection that is the key to information literacy development and maturity.

## **INTRODUCTION**

Think about your library clients searching for information. Almost all of our clients probably think that this searching is easy; they find *Google*, type in the desired topic, click the search button, scan the results list, and select. Voila! Quite simple, isn't it? Yet in their results did they find the best resources for their needs, or did they find a huge amount of junk? More importantly, what about that small handful of our users who are looking for that "needle in a haystack"; did they find it this way, or did they come to the information desk to ask for help? Have you considered that our search engines and library search interfaces may be contributing to why they can't find that blessed "needle in the haystack"?

In a study designed to uncover how tertiary students approached their internet information searching (Edwards, in press, 2006; Edwards, 2005), a series of implications were identified for the library and information science (LIS) sector; and for our information literacy (IL) programs. This paper will report on these implications. The identified implications for student learning and curriculum design have been dealt with elsewhere (Edwards, 2004; Edwards & Bruce, 2002a, 2004).

These following statements summarize the implications: The more we shift towards single entry point interfaces to our LIS or company websites, the more we may be hampering our clients searching ability development; and, the simpler our interfaces, the harder we may be making it for end-users to learn about and use the information environment. We must start to emphasise to clients that the key to effective searching lies in four basic processes, planning, acting, recording, and critically reflecting; reflecting on the results retrieved and the searching steps undertaken. This searching effectiveness also needs to be included in library portal design and IL programs.

## **THEORETICAL FRAMEWORK**

Information science research has shown growing interest in applying educational research into the variety of ways needed to understand the information searching process (Kuhlthau, 1988; Limberg, 2000). Many of these research studies have confirmed that human factors in web searching behaviour must not be ignored. The

study in this paper worked to categorize some of those factors, in particular, to both understand and identify the variation in university student's searching behaviour.

## **Methodology**

This research had a series of broad aims, and the preliminary results from this research have already been reported (Edwards, 2004; Edwards & Bruce, 2002a, 2004). The overarching aim was to uncover the variation in university students' understanding of the information searching and retrieval concepts. As the research aimed to uncover variation, phenomenography was selected as the appropriate method (Marton, 1981). Participants were QUT (Queensland University of Technology) first year, third year, or postgraduate students, drawn from six of the eight faculties at QUT. Therefore this study ensured that different cultures, ages, genders, disciplines, and even different information contexts were represented. Analysis of the data involved an iterative process of seeking meaning and structure. It was both a process of discovery and of construction (Bruce, 1997). The purpose was to clearly define each group's way of looking at the world. The transcripts were repeatedly checked to reveal any small similarities within the four categories; ensuring that the final four categories truly reflect the critical variation and differences in the way of experiencing a phenomenon. After the development of the categories of description (Edwards & Bruce, 2002a), the categories were further analysed to distil the essential structural variations in which the phenomenon is experienced (Edwards, 2004; Edwards, 2005). In this way, the study identified the variation found in each group's way of looking at the world.

## **Ways of experiencing information searching**

Analysis of the data gathered suggested a framework of four categories that capture student's different ways of searching and learning to search for internet based information resources. The four categories identified in the Web Searching Experiences Model (Edwards, 2005) were:

1. Information searching is seen as looking for a needle in a haystack.
2. Information searching is seen as finding a way through a maze.
3. Information searching is seen as using the tools as a filter.
4. Information searching is seen as panning for gold.

Each of these categories is associated with different meanings being assigned to the search experience. They are also associated with different awareness structures, different approaches to learning, and different search outcomes (Edwards, 2004; Edwards, 2005). The awareness structures are differentiated in terms of different foci, and also in the varying ways of seeing the information environment, the varying ways of seeing the information tool structure, and the significant variation in the awareness (or lack of awareness) of the quality of information (Edwards, 2004; Edwards & Bruce, 2004).

In essence what the research identified was a relational model of internet information searching; that is: how do the four varying ways of experiencing web information searching relate to each other. What aspects or elements are similar in each experience, and what aspects or elements are not common through the four identified category experiences (Edwards, 2004; Edwards 2005).

Importantly, the research identified that the four experiences of searching are roughly hierarchical in nature. That is, the latter experiences included the previous category experiences, and therefore, we can confidently expect that for each of the higher level categories the previous category experience has been built upon, and improved upon, as the student's searching experience progresses. The research findings clearly indicated that a learning environment may be developed to encourage the first step (Category 1 and 2) and then the following steps (Category 3 and then Category 4) approaches to the searching experiences.

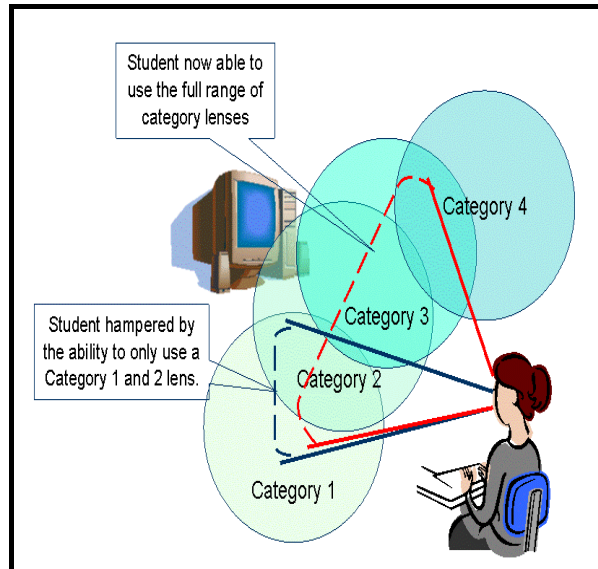


Figure 1: Ability to use the range of category lenses when searching.

It is significant to note here, that the identified four categories are not four different ways of searching as such. The lower level categories are not a misconception of the searching process or experience, and the higher level categories are not a reflection of expert versus novice searching approaches. The four categories are a repertoire of the varying ways of experiencing web-based information searching (Limberg, 2000). They are, if you like, four different lenses through which individuals experience information searching. As a searcher you decide which lens is the most appropriate to use in each different searching context. This variety of lenses is in fact necessary in order to be a competent web searcher. If an individual is hampered and does not have all of the available four lenses with which to view information searching (Figure 1), then the identified awareness structure of each of the categories (Edwards, 2004) will give us an indication of the ways to encourage our clients how to learn to use the other available lenses. That is, how to move up the searching steps.

Another important element also emerged. Two key aspects of the searching experience were identified; (i) the reflection over the search process and (ii) the planning of the search process (or in fact, the lack of these two aspects – in the case of Category 1 and 2) (Figure 2). These two aspects are critical dimensions of the identified variation. In short, the lenses, or levels, of information searching are related to how a student may plan and reflect, and in the more advanced experience levels it is a combination of how they cognitively plan and how they act, or perform, the search in practice.

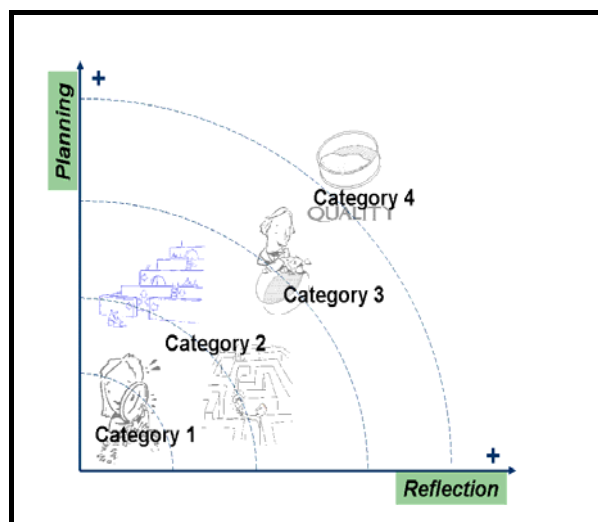


Figure 2: Critical Differences of reflection and planning

It is essential then that these aspects, the acts of search planning and searching reflection, need to be built into any searching environment. Furthermore, the myriad of individual aspects, or dimensions of variation, which are barely perceived in the earlier category levels also need to be built into that environment (Edwards, 2004; Edwards, 2005). These aspects include a focus on the individual searching features of the various database tools used in the online environment (that is: the search control features of search engine and/or library databases; features such as Boolean operators, truncation and wildcard use, or synonym use, etc.) and the engagement, or lack of it, of the searcher reading their screens for instructions. For years, library and IL programs have referred to these items, but they are often ignored by our users because these aspects are spoken about in abstract without providing the user the opportunity to use search features, and reflect on that use, while searching. We need to encourage our library users to experience planning a search and to also experience reflecting upon their searching.

## DISCUSSION AND RECOMMENDATIONS

Earlier research by Edwards and Bruce identified an action research model of reflective Internet searching (Edwards & Bruce, 2002b). With this model they proposed that information searching may be considered as an action research model, a model that shows how searchers plan, act upon, record their results, and reflect upon their results throughout the searching process. The four categories identified in this study (Figure 2), can be mapped against the Reflective Internet Searching Model and by so doing, we can identify the steps missing (or only barely considered steps) in searching approaches for each category (Figure 3).

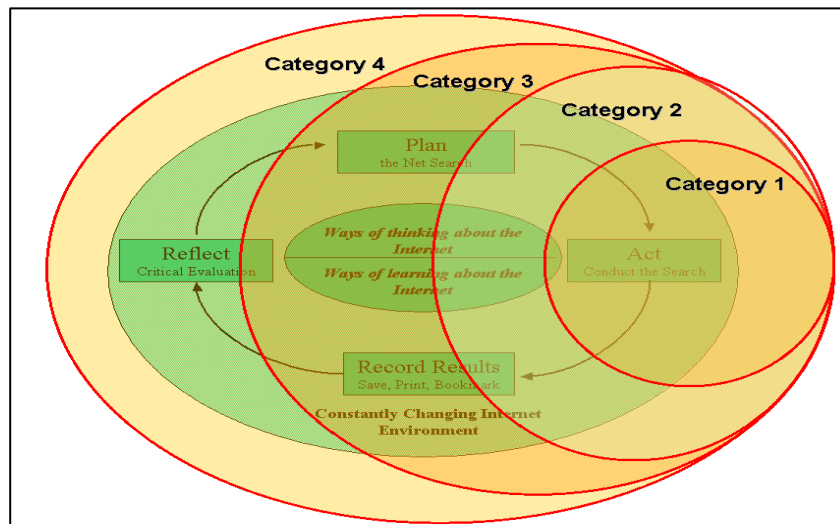


Figure 3: Reflective Internet Searching Model mapped against identified 4 Categories

In mapping the categories to the model, clearly students experiencing the lower level experience (the haystack lens) act, but they are not planning and reflecting. Those with the middle level experiences of Category 2 (the maze lens) and Category 3 (the filter lens) are beginning to both cognitively plan and reflect on their results, but only those experiencing the higher level experience of Category 4 (the panning of gold lens) truly have the ability to cognitively plan and at the same time reflect on how their plan, and their actions when searching, have worked in practice.

From mapping the categories against the model there is support that this early model (Edwards & Bruce, 2002b) is now likely to be suitable for all age groups, for both neophyte and expert searchers, and for those who are more or less information technology literate. The missing step is critical reflection. That critical reflection is both on the process in which they are participating, and on the searching results they have found. Bruce (2002, p.14) suggests there are *three critical elements of learning to be information literate*:

- Experiencing information literacy (learning),
- Reflection on experience (being aware of learning), and
- Application of experience to novel contexts (transfer of learning).

The key to our IL programs, then, would be that we encourage each of these aspects; that we encourage our clients to experience learning to be information literate, we give them the time and opportunity to reflect upon what they are learning and, hopefully, they can then transfer this experience to each novel context. This study certainly confirms these findings. The key to be an effective information searcher is to have experienced the variety of available lenses through which to view the searching experience, to reflect on this as it is learnt, and afterwards to be able to apply the appropriate lens to each new information searching context.

In our IL programs we must emphasise that the key to effective searching lies in four basic processes; planning, acting, recording and, critically reflecting on what has been retrieved and undertaken. The steps in the process however are not static, they change in the context of each different searching tool, and the steps continue and remain in a continuous cycle until *gold* is found. Despite that, we should not teach these aspects as steps, but instead we should leave these aspects as a guiding background principle for us to develop and craft the experiences of our users; allowing them the time needed to reflect on the steps in the process themselves.

### **Library portal or Library search tool recommendations**

When you consider library portal implications from this research, then a number of concerns are evident, For example, consider those individuals who only, or predominantly, use a Category 1 search strategy,. Firstly, they would have a focus on the search textbox, and they will probably not be reading their screens adequately (Edwards, 2004; Edwards, 2005). Consider also that for these clients, with the increase in portals or gateways designed for easy use and for the searching of complicated information environments, a searching strategy approach becomes even more hampered. For example, imagine you can only use a Category 1 lens and that you have just opened the simple *Google* interface; an interface which makes the entire Internet easy and simple to search; ‘Look, there are over 8 thousand million websites here!’ (Figure 4). You can now search for images, groups, news – whatever you want! It seems so simple, but is it? That ‘haystack’ your client sees just gets bigger. Every couple of weeks, when they open the search window to *Google*, the number of sites searched increases. It is not easier; it is just an ever growing enormous haystack that gets harder for them to search, because that results list gets bigger every time.



Figure 4 Google.com.au entry screen. [Screen shot captured 19<sup>th</sup> Nov. 2004]  
The over 8,000,000,000 webpages searched is identified in the oval

Given this Category 1 user experience, now consider your library website. Are we really making it easier for users when we design single entry point search interfaces? Some LIS websites are designed to mimic the search engines simple interface approach, giving their clients a single interface to the library, and more importantly, a single interface to the databases available for searching. Yet is this less confusing for our clients than using the multitudes of different database interfaces? The results of this study suggest, that the simpler we are making our interfaces, the harder we are making it for end-users to learn about the environment they are using. If our users see a search textbox that asks them to search to find a suitable database, and then after typing in a very specific search term get no results, do they assume that the library does not have the resources they need? They may not realize that they should have first selected the database and then searched these for results. By not showing the different interfaces we may be making the environment structure more invisible to our users. This study confirms claims (Conole, 2002) that the growth in portals and information gateways, may be making the problem worse rather than better.

### Information literacy programs

We should also reconsider the approaches we use in our LIS IL programs. Clearly, a walk through the library, or basic IL instruction delivered in a training room, encourages our clients to switch off. They may remember terms like Boolean, wildcards or truncation, but for some of our clients these terms (and the meaning behind them) will drift in one ear and back out the other rapidly, leaving little or no understanding of the searching skill, or experience, available for them to utilise later.

For training based IL programs, consideration should be given to encouraging clients to move beyond *Google*. You should consider using the recently introduced *Google Scholar* (Beta version: <http://scholar.google.com/>). This version of *Google* allows searchers to easily *pan for gold* via the Internet (a Category 4 experience), as they can search through a listing of scholarly literature which includes theses, books, technical reports, peer-reviewed papers, preprints, abstracts, all selected from preprint repositories, universities, professional societies, academic publishers and other scholarly websites. From this starting point, discussions about quality on the Internet, and even reliability issues, will be easy to understand, while still allowing your client to use the tool with which they are the most familiar. After this gentle introduction the other scholarly library database tools will be an easy stepping-stone for your client. During the training discussions you can include examples of the same search executed in normal *Google*, compared to *Google Scholar*, and then executed again in any database. It is important that your client, rather than the instructor, do these searches, and that the client is asked to reflect, in pairs or teams, on what they have noticed.

It is also important to provide your clients with IL programs that have specific searching examples; such as a series of web hunt exercises. You could include a hunt for a topic that cannot be found easily unless the client uses the Boolean operator 'not', or a hunt that provides the client with a phrase from a site you have already identified, and then ask them to find that site, and identify who wrote it. The phrase search has two benefits; (1) it shows how easy it can be to search for complex topics or phrases using phrase searching, and (2) it shows clients, particularly students, how easy it is to find evidence of copying or blatant plagiarism.

### **Web entry point screen design**

*... Human[s] beings are remarkably ingenious in their ability to ignore, work around or subvert information initiatives that they don't see as being in their best interest. It is time to stop cursing these recalcitrant customers and take their information behaviour seriously (Davenport, 1997, p.11).*

Instead of being annoyed that our user doesn't adequately read the screens we have designed, accept that they probably do not do this and try to design a site that grabs their attention and almost forces them to read what you want them to see. Break your entry screens up a little more and have stages of entry to each section. Consider having two versions of entry, one for those users new to the site and one for those familiar with the site. You can have advanced screens for those familiar, and entry-level screens that have decision making options for those who need to learn how the environment of the library is really structured (Clyde & Klobas, 2001).

In a site designed to instruct your users in IL practices, where you expect clients to use these areas both on- and off-site, have a second look at the activities you are expecting them to undertake. Ensure the exercises are designed to cover all of the aspects considered critical, not just a few of them. Have you encouraged them to understand the information environment, or assumed they already understand it? Have you assumed they understand the structure and searching features of the search tools? Have you asked your user to reflect and consider what they are doing? Have you encouraged them to *pan for gold*? Ensure your site is designed to encourage your clients to see the variation in searching practices available as they experience them.

Most importantly, any site you design should have an element of fun! This study has identified how critical the enthusiasm of the teacher was for student learning, how they enjoyed the fun approach to the classes, and how important the more light-hearted elements of the online site were to them also (Edwards & Bruce 2004). We can utilise the element of fun, to ensure our LIS interfaces are not dull and boring.

### **CONCLUSION**

There are a number of implications for IL that this study has identified. As you consider the recommendations above, also consider working together with your staff to evaluate what is working in all of your IL programs and what needs improvement. If you are in an academic setting, get the feedback from the academic's classes, from the students, from the tutors of the students. If you are from the LIS sector get feedback from your IL program instructors, and from you clients – what have they

noticed, or not? Start to work together to design searching experiences that demonstrate all of the variation in searching and allow your client the ability to reflect on and consider what they have seen. Most importantly, it is time to emphasise to your clients that the key to effective searching lies in four basic processes, planning, acting, recording, and critically reflecting; reflecting on what has been retrieved and the searching steps undertaken.

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