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SEARCHING ONLINE DATABASES:
IMPLICATIONS FOR THE HIGH SCHOOL CLASSROOM

BY

DIANE GALLOWAYSOLOWAN

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Searching Online Databases: Implications for the High School Classroom

Submitted By Diane GallowaySolowan

In Partial Fulfillment of the Requirements for the Degree of Master of Education

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“There is no use trying,” said Alice; “one can’t believe impossible things.” “I dare say you haven’t had much practice,” said the Queen. “When I was your age, I always did it for half an hour a day. Why, sometimes I’ve believed as many as six impossible things before breakfast.” -Lewis Carroll

I would like to express my deep appreciation to Dr. Jennifer Branch for challenging me to believe I could accomplish what I viewed as an impossible thing: the completion of my Masters of Education program at the ripe old age of fifty-something! Your patience and generous offering of time and guidance has steered me along to my goal in record time.

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Introduction

Today's school library collections have a different look and feel. Along with print resources, we now find digital ones. In terms of high school reference collections in particular, online databases are becoming more common as student reference resources. Besides saving space on the shelves, they are an economical means to providing access to vetted current information that is linked to curriculum. However, online databases present a unique set of problems for student searchers, even for those who claim to be Internet savvy.

It is simply incorrect to assume that students automatically know how to conduct purposeful and efficient searches when using online databases. Just as teacher-librarians find it valuable to teach students how to access information from print materials, it is equally important that we teach them how to access information using electronic resources. The caveat to that instruction being that it take place in the greater context of school library information literacy programs.

Regardless of the post-secondary options high school students may choose, many will find themselves faced with the ubiquitous first under-grad research paper. They will be attempting that research in libraries whose collections are increasingly digital. I would suggest that rather than have them go down in flames round one, it is vitally important to consider what we can offer high school students in preparation for this experience. Providing opportunities for them to learn good online search skills in the context of curriculum-based inquiry at the secondary school level is one such offering.

To provide context for these ideas the first section of my paper relates my personal experience as a high school teacher-librarian using online databases for student

research. This is followed by a review of the current literature addressing student online search behaviour, its place in the information literacy process and its impact related to post-secondary education. The third section draws attention to implications for high school educators that include a rationale for adopting a school-wide research process model that incorporates the teaching of online searching in reference to current curriculum documents and ways schools can gain economic access to online databases for their students. My paper concludes with a discussion about the value of such teaching for high school students along with some practical tips teachers and teacher-librarians can use to introduce online searching in their classrooms.

Great Expectations!

1989 seems like a very long time ago. On reflection, it was without question a pivotal year in my career as a teacher-librarian. Two things happened. First, I was hired as the teacher-librarian for a brand new high school that included grades 9-12 and offered then state-of-the art technological infrastructure. Very shortly thereafter, I ran across a book titled Online Searching goes to School (Epler, 1989). The convergence of these two events shaped what would become my teaching passion: working collaboratively with teachers and students while enabling them to become selective, critical and effective users of electronic information resources.

I had long dreamed of one day working in a high school library. In my former junior high school, I had the opportunity to make the precarious leap from print to an online circulation and cataloging system. This only whetted my appetite for technological solutions in the school library. My new school offered an opportunity to stretch these

boundaries even further with its capability to network student computers. The support and confidence of a forward-thinking principal completed the picture. I had to pinch myself to believe it was true!

Furthermore, my new library was a blank slate. There was no collection in place and it was my job to develop it. Online databases were not unheard-of in 1989; they were just not a common resource in school libraries, especially Canadian ones. But Epler's ideas sparked my imagination. What if my new library could include access to online databases as part of our collection? What advantage would they bring to the staff and students? Did I know enough about them to provide the necessary in-service and teaching that would be required? Would I be creating a monster?

Our Changing Collection & Teacher Apprehension

The challenge was too enticing to pass up. I guess you would classify me as an 'early adopter'. Along with selecting print resources, I began the search for suitable electronic resources to add to our collection. I was aware of two types of product, the CD-ROM encyclopedia and online bibliographic databases such as *Dialog* and *ERIC* which were more commonly used by the corporate world and university libraries. Epler (1989) was one of the first to suggest there was also a place for this kind of resource in schools; however, subscriptions were costly.

Our school computers were capable of reading CD-ROM technology. A handful of CD-ROMs came bundled free with our new Macintosh computers. Among these was Microsoft's *Encarta* encyclopedia, a modified version to be sure, but nonetheless a place to begin electronic searching. When I introduced these cd-roms to students, many took to

this new research format like ducks to water. From then on research in our school library shifted into a whole new dimension.

It was only a matter of time until the trickle of information available on CD-ROM became a deluge and along with that came requests, mostly from students for more and better electronic resources. Although free cd-rom versions proliferated, they proved frustrating due to their scant digest format. It was time to hand over real cash for the full versions. Our initial purchase of a recommended CD-ROM encyclopedia was Grolier's *Electronic Encyclopedia*. Next we purchased the full version of Microsoft's *Encarta* along with automatic updates to meet demand and to attempt to balance collection content available in this format. Students were eager to experiment with the technology, yet teachers shied away from it continuing to rely primarily on print resources and viewing with skepticism the emerging trend in the way students were beginning to access information.

While I taught short lessons on how to search the electronic resources I was also still teaching them how to use the print version of the *Reader's Guide to Periodical Literature* as we had no access to an electronic version of this resource. The small print, incredible cross-referencing and the frustration of deciding whether article citations referred to full text articles or abstracts proved daunting for all. Even though our periodical collection was robust, to the students' dismay it seldom matched the citations they found in *Readers' Guide*.

By early 1991 the majority of our print and multimedia collection was in place. Our healthy implementation budget had evaporated and further collection development began to come under increasing scrutiny. Hesitantly the teaching staff supported my

purchase of *EBSCO Masterfile Premiere*, an aggregated database of full-text magazine articles on CD-ROM. The sizeable purchase price did include bi-annual updates. This new access to full-text magazine articles and a printer took students and teachers to new levels of research capability. The line-up to use this resource grew longer every class, and I noticed the students were now much more willing to use magazine articles in their research, despite the fact that they often had to load up to three or four discs to complete their search. The speed and ease of access seemed most paramount to them.

Still most teachers were hesitant to experiment with this resource. Although pleased to see the engagement of their students, they, themselves displayed a significant lack of understanding of what the database contained. Teachers also displayed personal apprehension in learning to search electronic resources. I sensed a growing need for more structured teaching related to online databases for both students and staff. At the same time, I realized I needed to become a much better online searcher myself in order to teach these skills well.

Learning from the Real World

Sometimes the stars align just when they need to. In 1993 I was able to take a year of personal leave from teaching to work in a special library for engineers. Part of my new job included searching *Dialog* databases for the firm's engineers and for private clients. If people were willing to pay for access to information this way then surely it was a valuable commodity and an emerging retrieval technology. A side benefit of my work there was the training I acquired in searching *Dialog* databases. That same year, I witnessed the introduction of an even more cutting-edge information tool. The Internet

had arrived. I could hardly wait to return to my school to share my new found knowledge and skills.

On my return, I was able to convince a few teachers to collaborate with me and we included lessons about online searching as part of their class assigned research projects. This often meant allowing for more class time in the library during a project to make sure that all students had the opportunity to access the electronic resources. High school teachers have tight time-lines to meet course requirements, and agreeing to extra class research time in the library was a considerable sacrifice for them to make. To offset what might have appeared as wasted time, we agreed that project assessments would include evaluations of how well students used their newly acquired search skills. I would be responsible for that evaluation. The year went by but I was disappointed with the little progress I had made with only a small number of the teachers and students.

Influence of ICT Curriculum

The following year our school library gained access to an Internet connection; it was slow but usable due to advancing browser capability. A new wave of excitement took over. We were now caught up in searching for information, online, in an entirely different way. Once again I sat down with staff to discuss how we might include the teaching of Internet search skills as part of the research process. In 1994 we had not formally identified our plan as an information literacy program, but that is what one would call it today. What emerged back then was simply a plan to incorporate a research skill component as part of the program for all Grade 9 Language Arts students in their first semester.

Our planning was also driven by the newly mandated infusion of the Information & Communication Technology (ICT) program of studies into the Alberta curriculum. The rationale for this curriculum clearly stated that it was “not intended to stand alone, but rather to be infused within core courses and programs” such as English Language Arts (Alberta Education, 2007). It was also an outcome-based curriculum with an assessment framework for measuring student competencies. Three general outcomes were addressed: (1) communicating, inquiring, decision making and problem solving; (2) foundational operations, knowledge and concepts; and (3) processes for productivity. Within each general outcome were more specific ones such as: having students use a variety of technologies to seek alternative points of view; using technology to enhance inquiry, investigate and problem solve and use electronic research techniques to create new knowledge and meaning.

As the teacher-librarian, I agreed to collaboratively teach the ICT skills identified for Grade 9 Language Arts students, all 235 of them. In our case this included teaching online searching skills in the context of evaluating authority and relevance of online information to a particular topic.

There were eight sections of Language Arts students assigned to six teachers. Each section met for two instructional blocks each week for one semester. Students applied what they learned in class by completing a personal research project that was shared with their peers in the now ubiquitous PowerPoint format. Their project evaluations included an ICT outcome component for which I was responsible for marking.

It was a gargantuan task! The work was exhausting but gratifying in the quality of projects produced and the leap in confidence and learning acquired by the students.

Teachers actually enjoyed marking the projects. Our plan was successful to the degree that all Grade 9 students in our school were now equipped with a research skill set they could apply across the curriculum throughout their high school careers. Of course, it was assumed that the skills acquired in Grade 9 would be reinforced and extended through succeeding grade levels. The Language Arts teachers agreed that the instructional unit was worth teaching again with our new group of Grade 9 students in the following year.

We continued this program for the next three years. During that time the expensive and burgeoning CD-ROM subscription to *EBSCO Masterfile Premiere* was replaced by online access to the product via an Internet connection to the regional library system of which our school district was a member. Then in 2001 the provincial Department of Education initiated a project to provincially license a broader range of electronic reference resources for the K-12 educational community. Our students now had access to nine more online databases for their research. This project became known as the Online Reference Centre (ORC). It's inception was a huge step toward equalizing access to these kinds of resources for all students and teachers in the province.

The Challenge of Copy & Paste Technology

As the ease of access to and speed of delivery of information over the Internet grew, my teaching staff continued to face considerable challenges in convincing students that vetted online resources offered more value for time spent searching. With just a few keystrokes search engines like *Yahoo* and *Altavista* delivered boatloads of information.

The ease with which students could now find and extract information by simply copying and pasting it into assignments seemed to blur traditional expectations for acknowledging sources. We realized that, although we had carefully taught lessons on how to cite sources for all kinds of information formats, it appeared students still tended to associate that process with print materials. It was time to re-visit our information literacy program to see how we could do a better job of teaching students to evaluate and properly cite both print and electronic information.

About the time this issue became really vexing I read about a free resource on the Internet called *Noodletools.com* that was developed by a teacher-librarian for just this very purpose: making the work of citing sources easy! Students could create citations by simply selecting a media type from a drop-down menu and then filling in the subsequent form on the web site. As each form was completed, one click transformed the information into proper MLA format. By introducing and encouraging the use of the website, we were able to make significant inroads with students on the citation issue. Knowing that students were using a consistent format for citing sources in all subject areas was a plus for all teachers.

Reflecting on Practice

On reflection, over the five years during which our information literacy program was viable, I realize that it was decidedly a success in terms of the number of students we reached. It was also successful in relation to what we were able to observe and learn about student online search behavior. Although these observations were anecdotal they did point to the next steps needed in the delivery of our information literacy program

during those five years. But as the saying goes, ‘all good things come to an end’ and such was the case for our program. Due to budget restraints, increasing enrollments, and fewer teachers I was pulled back into the classroom to teach other courses. This resulted in a significant loss of flexible teacher-librarian time, and unfortunately (and not surprisingly) teachers were not prepared to continue the information literacy program independent of my collaboration.

As a high-school teacher-librarian, the experience of developing and teaching this program raised many questions related to student research in a digital world. I wondered whether our kids had really benefited from the instruction. What had they specifically learned about online searching? Would they now be able to adapt more easily to searching other digital library environments, for instance post-secondary libraries? Would they make conscious decisions to select and search authorized online databases or default to the tantalizing ease of *GOOGLE* and one-word searches each time they logged on to the Internet? With the numbers of teacher-librarians steadily dwindling in schools, could teachers be convinced to take up the challenge of imparting online search skills to their students? How much did it really matter in the great scheme of things?

Moving On

In 2003 I enrolled in the Masters of Education in Teacher-Librarianship program at the University of Alberta with the intent to further explore answers to my questions. One year into the program, I was hired by The Alberta Library to coordinate the Online Reference Centre (ORC) project. They were looking for a teacher-librarian with experience using online reference databases in a school setting, along with expertise in

online searching and teacher professional development that would assist in the management and promotion of the ORC resources to educators across the province. After twenty-four years in school libraries this seemed like the ideal opportunity to share what I'd learned about using electronic resources in school libraries.

Traveling across the province these past four years presenting in-service to teachers has only served to deepen my concern in relation to their willingness to embrace information literacy programs that include teaching students to use online databases as research resources. This reluctance on the part of classroom teachers, despite the nearly ubiquitous use of computer technology available to them, continues to leave high school graduates without the opportunity to learn how to use electronic resources effectively. These students will be moving on to a wide range of post-secondary education institutions whose libraries in some cases subscribe to over 12 000 online journals annually and where remote access to such resources often precludes one rarely ever having to actually physically visit the university or college library. Besides, many post-secondary courses are delivered online, further increasing the need for remote access to research resources.

After more than a decade of professional practice working with teachers and students using online databases in school libraries, I chose to examine the literature related to student online search skills as part of my study. I wanted to explore further its implications for teacher-librarians and teachers in the classroom in relation to inquiry based research models, emerging technology expectations being incorporated into new curriculum development, and the value of such an acquired skill-set in the post-secondary learning environment.

Literature Review

High school and academic library collections are steadily increasing their offerings of electronic information resources for student researchers. This literature review addresses the research related to our understanding of the online search behaviour of high schools students, the teaching of online search skills as part of high school information literacy programs, and the need for those same students to enter post-secondary education with the necessary skill set required to use online databases to their academic advantage in that setting.

Online Search Behavior of High School Students

Information seeking is generally driven by two kinds of motivations: personal or imposed. Due to the nature of the school environment, high school students' information seeking is predominantly imposed on them by their teachers. Knowing how to find the information they need among the many resources offered by the school library can be a daunting task. Branch (2002), Fitzgerald and Galloway (2001), and Neuman (1995) concur that many students experience difficulty with research in general and look to teachers and teacher-librarians to teach them the necessary skills to become efficient effective searchers. However, more frequently students are faced with completing assignments that involve the use of the Internet and full-text electronic information resources.

The increasing ease of access to technology brings with it assumptions that using the technology will also be easy. Scott and O'Sullivan (2005) in their research with high

school students searching the Internet state “many students in our study sample claimed to have accomplished skills in navigating the Internet, [yet] in actuality, cyberspace is still a confusing medium for many of them to traverse” (p. 2). Fidel et al. (1999) indicates that students felt great frustration when the Internet failed to produce acceptable search results quickly. The students assumed “there was no need to plan ahead because the progression of a search would be largely determined by what they saw on the screen” (p. 27). Fidel et al. (1999) and Marchionini (1989) reported that novice student searchers most frequently began a search by entering keywords if they saw a search box on the screen or by attempting to type in a URL rather than spending time thinking through search terms that would apply to the topic in question. The Fidel et al (1999) study reports that finding the answer to the question posed by their teachers served as the focusing strategy employed by all students in their study. In relation to a student’s question, relevance was most often determined by what appeared on the first screen of the first web site they found.

Effective searching of electronic resources requires a set of strategic thinking skills or strategies in order to achieve focused and reliable search results. Using simple keyword searches that bring long lists of results when searching the Internet also fail students when applied to CD-ROM or online databases. Without an effective search plan, novice users are faced with “disorientation, navigation inefficiency and cognitive overload” (Branch, 2002, p. 1). Debowski (2001), along with Scott and O’Sullivan (2005), found that student searchers without a plan most often resorted to either simply making minor changes to their original keyword search or using the ‘back’ button to reorient themselves when their searches failed to produce adequate results. Fidel et al.

(1999) discovered that mechanical issues related to misspellings caused student searchers to fail to find relevant search results. Marchionini (1989) noted that “student search pattern analysis depicted a strategy that might be called interactive browsing” with no real plan in mind, consequently reacting to results only after tentative queries were performed (p. 64). In the literature, there is shared concern about how students, especially children or novice users, understand and adapt to the controlled vocabularies of electronic of subject searching, resorting to the use of natural language queries. For example, (Broch, 2000) reiterates (Bilal, 1998) who posited the typical language query, “Are dolophins fish?”

Neuman (1995) attempted to “identify how databases and instruction in their use should be organized and presented to enable students to gain the greatest benefits from these tools” (p. 284). She recommended a high school database curriculum be developed that included full-text database searching as part of understanding the research process, or what we now know as information literacy instruction programs. Howe (2002) took these recommendations to heart, outlining a syllabus for teaching a course in electronic search skills to high school students.

Information Literacy Instruction

Information literacy is a term that many educators have come to understand as a set of skills one needs to acquire in order to be able to function effectively in the workplace. In today’s world this includes the ability to access, evaluate and manipulate information in electronic environments. From the workforce perspective, it can be interpreted as a measurable information and communication technology (ICT) outcome

or proficiency, “a blend of cognitive and technical capabilities required to negotiate information demands in the academy, or the workplace, or society” (Educational Testing Society, 2002, p. 3).

In school and academic libraries, information literacy is considered the ability to access information efficiently and effectively as part of the research process and to analyze and evaluate that information for the purposes of problem solving or informing opinion. In the past several decades, school library information literacy programs have begun to incorporate information research process models to assist students in becoming information literate. Kuhlthau’s (2003) model, among others, offers a scaffolding framework that addresses affective as well as cognitive processes student learners experience during a research project. *Focus on Inquiry* is an information research process model developed by Alberta Learning for use by teachers and teacher-librarians that draws on Kuhlthau’s (2003) work, but tailors the information search process to meet provincial curriculum needs related to inquiry-based learning for teachers and teacher-librarians in Alberta (Alberta Learning, 2004). The Alberta model includes a seventh stage, *reflecting on the process* that is not always addressed by other models. Both Kuhlthau’s Information Search Process (ISP) model and the Alberta model include a retrieval stage requiring students to gather information related to their specific research question. Of course this information can be collected from a variety of sources, including print and electronic formats.

Neuman (2003) draws attention to the relationship between information literacy programs, student learning and the role of the teacher librarian. She introduces the notion that the acquisition of information literacy itself can be accounted for in terms of learner

outcomes measured by assessment tools. Lance's (2002) research now replicated in several U.S. states and in one Canadian province, clearly extends this thinking by demonstrating that the acquisition of information literacy skills can be linked directly to student academic achievement. One particular finding of his work suggests that high schools with computers that connect to library catalogs and databases average as much as a 6.2% improvement on American College Testing (ACT) scores (Lance, 2002). This is a significant percentage increase in test scores lending further credibility to the inclusion of teaching online searching as part of the high school information literacy program if only in terms of helping students in the competition for admission to post-secondary learning institutions. This would further suggest that there is serious need for teachers and teacher-librarians to collaborate in analyzing their respective high school curriculums in order to determine how such skills could be taught and at what point in the learning process they should be introduced (Scott & O'Sullivan, 2005).

But task analytical analysis of curricula with a view to establishing a scope or sequence of search skills and information literacy may not necessarily garner the desired outcomes. Kapitzke (2001) questions these outcomes and cautions that rather than define information literacy as a process, a skill or a competence, it is better understood in terms of social and cultural change where it "[becomes a] situated response to the specific political economies of educational contexts and classrooms" (p. 3). Her theory emphasizes a departure in traditional thinking about school libraries as traditionally neutral places where students can go to find information. She goes so far as to indict many school library information literacy programs as simply rubber-stamping the corporate world's need for students to acquire a set of information literacy skills

necessary for the world of work. Her primary concern lies with the potential for our present information literacy strategies to continue to reinforce the global digital divide between those who have access to such educational practice and those who do not. She questions whether school library information literacy programs have adopted an “instrumental or “operational” approach to information, in which students learn *with* and *through* information, but fall short of learning *about* information and *about* knowledge (Katpitzke, 2003, p. 46).

Kapitzke (2003) invites teacher-librarians to consider the students we teach and the nature of the electronic environments and devices which have become so much a part of their daily lives. She proposes moving toward a hyperliteracy that she says “occur[s] when the practices of critical literacy, media literacy, visual literacy, and multiliteracies fuse in hypermediated textual environments (p. 52). Given that and the state of flux in which school libraries now find themselves in relation to the varied plethora of available digital resources that are finding their way into school library collections, to ignore her thinking is tantamount to denying these things exist. As educators we need to acknowledge that regardless of whether our school libraries are either predominantly physical or virtual spaces where students daily encounter resources such as online databases, we need to be teaching them how to best access that information and honour the time required to consider its merit through a discourse of critical analysis.

Preparation for Post-secondary Education

According to Fitzgerald (2004), many students who find high school easy struggle through their first year of university and most students who drop out do so within the first

year. Studies undertaken to understand this phenomena point to college professors expectations and the information literacy skill proficiency undergraduate students bring to their initial college or university experience. Fitzgerald (2004) cites three separate studies which attempt to identify information literacy skills expected of first-year college students. All three mention that professors value information-finding skills, the ability to conduct disciplined planned inquiry, good online search techniques and the ability to distinguish between scholarly or peer-reviewed journals and magazines.

Bodi (2002), Esch and Crawford (2006), and Fitzgerald (2004) strongly suggest that teacher-librarians can play an instrumental role in easing this transition for high school graduates by ensuring that school level information literacy instruction addresses these issues. High school teachers and teacher-librarians need to heed Fitzgerald's words that "any grade from middle school up may be our last chance to help a student learn these critical skills" (p. 6). Imparting that instruction should become a vital part of our high school information literacy programs.

Librarians working in college and academic libraries agree that undergraduate students are faced with at least four major issues when beginning research for course assignments: (1) lack of skill in identifying a focus for their research, (2) inability to select subject headings that will return adequate results in resources that use controlled vocabularies, (3) uncritical acceptance of the information they do select whether it be Internet web sites or articles from an online database, and (4) an increasing disrespect for intellectual property (Bodi, 2002; Manuel, 2005). Faced with these issues academic librarians have begun to consider undergrads much more as research novices rather than full-blown scholars and are exploring means to adjust the delivery of their information

literacy programs. They have also begun to investigate how the information research process models adopted by teacher-librarians may apply in the post-secondary setting (Bodi, 2002; Smalley, 2004).

Implications for Educators

There can be little doubt in 2007 that moving from a traditional linear bibliographic paradigm to a digital one has put an entirely new spin on research at school and beyond. It is one thing to be on the 'cutting edge' of this phenomenon, but it further implicates us as educators to continually examine why and how we approach instruction related to emerging electronic media literacies (Kapitzke, 2003).

Online databases are only one type of electronic media and they themselves are not what they were when I first began teaching my students how to use them in the early 1990s. Multiple databases can now be searched at once. One can now use advanced Boolean options such as proximity operators in our searches to significantly narrow search results. Students can easily create bibliographic reference lists from electronically stored citations that they can utilize multiple times if necessary. Searchers can request that a database provide ongoing e-mail alerts for a specific topic of interest. Most significantly, this searching can be done without ever darkening the door of a library building.

However we choose to incorporate the teaching of online database searching, not only for high school students, but for students at all levels, it is fundamental that we understand that it should not be undertaken as stand-alone skill instruction from a purely technical point of view. The research cited in this paper clearly explicates the need for

such instruction to be part of a much more complex information literacy program. It is paramount that we as educators clearly understand the implications of not teaching online search skills. The research confirms how much students need this opportunity to learn before they move on to universities and colleges.

If teachers or teacher-librarians think they find themselves lacking expertise with which to tackle information literacy instruction for their students, it is even more important that those in charge of pre-service teacher education programs begin to address the role of “instructional methods related to information literacy” (Asselin & Lee, 2002). We simply cannot afford to assume that beginning teachers will somehow pick up the slack in relation to teaching 21st century information literacy skills to students just because they may be considered more familiar with computer technology. This would be equivalent to encouraging the development of subject area specialties without curriculum and instruction practices. A further concern is that pre-service teachers now enrolled in faculties of education across the country are admitting to lacking these very same skills in order to be successful in their own post secondary experience (Asselin & Lee, 2002).

Ideally all schools should have access to a teacher-librarian with the expertise necessary to implement and maintain an information literacy program in a school library. Ideally that teacher-librarian would be in a position to work collaboratively with teachers to ensure that all students in the school benefited from information literacy skills instruction at appropriate times over their school career (Smalley, 2004). However, that is not always the case neither in our province nor in many others across the nation. Hence that role falls to individual teachers and as such presents problems in capability, consistency, and continuity of instruction (Asselin & Lee, 2002).

In the next section of this paper, I will introduce steps teachers can take to begin implementing information literacy programs in their high schools. These strategies include: (1) the adoption of a school based information research process model; (2) identifying those curriculum outcomes that include searching online information resources as part of curricular expectation; (3) how to attain school or provincial access to online databases; and (4) the need to build relationships with post-secondary libraries in preparation for student transition to those institutions. I will also address specific reference to such implementation strategies in the Alberta context.

Selecting a Research Process Model

Teaching is most often practiced in isolation. Without leadership or a specified focusing issue, teachers tend to go it alone in their subject area. Compressed timelines, pressure for ongoing assessment, and coping with day to day student behaviour often blur the bigger picture. However, most of us assign a research project at least once during the school year. For students who must complete these projects, a myriad of teacher expectations is thrown at them, only adding to their confusion. The process of research is difficult enough for novices without these additional dimensions (Fitzgerald & Galloway, 2001; Neuman, 1995).

Selecting a research process model that all teachers in the school can agree to is the first step toward creating an information literacy program that provides consistent expectations for students. That program should allow for incremental growth in student skill and understanding. Reinforcement of that learning is accomplished with repeated practice over grade levels and in different subject areas. There are many information

literacy models to choose from, two of which have been cited in this paper. Both of these models identify ‘collection’ or ‘retrieval’ stages as part of the research process (Alberta Learning, 2004; Kaptizke., 2003; Kuhlthau, 2003).

Gathering information from online databases is just one aspect of the retrieval stage in the research process. These models elaborate this stage by clearly defining what is expected of students in terms of planning focused searches that will return relevant results. How to appropriately acknowledge the information source is elaborated. Teachers need to find ways to incorporate the use of full-text online databases in their class research assignments as a means to developing student retrieval skills. Students need to understand the difference between a keyword or natural language search and they help students to avoid selecting search terms that do not work with the controlled vocabulary subject headings used by database producers (Bodi, 2002; Manuel, 2005).

Alberta Learning’s (2004) *Focus on Inquiry* devotes an entire chapter to teaching the retrieving phase of the information process model. It offers a well-defined list of *key leanings*, strategies to build student skills, information on how to assess students’ searching success, and a sample activity in the form of a pathfinder for students to follow. The sub-section, *Thinking about Retrieving*, provides ample background information for teachers to help them understand how students experience this process. This particular model also emphasizes the provision of opportunities to have students debrief or reflect on their personal information searching experience (Alberta Learning, 2004).

Curriculum Links to Online Searching

Programs of Study and their companion curriculum documents provide the framework for classroom teaching. Within these documents we find the keys to unlocking the content students must learn at each grade level in order to move to the next. Regardless of where we teach in Canada, these documents tend to be written in a similar manner and are revised and updated on a reasonably regular basis. However, it must be noted that not all curricula use common terminology teachers would recognize as the implying they include online searching as an explicit skill students need to acquire and apply in their daily learning.

Close examination of several Alberta curriculum documents reveals several terms that signal reference to incorporating student use of electronic resources. The terms include: *skill outcomes, learner expectations, deliberative inquiry, and decision-making skills, problem-solving and research*. These terms were found in curriculum related to Social Studies, English Language Arts, Science and Math from Kindergarten to Grade 12 as early as 1996.

For example, the Elementary Science Curriculum for Grade 6 describes a *Specific Learner Expectation* that states students must be able to “identify *sources* of information and ideas and demonstrate skill in accessing them. These *sources* [are defined as] the library, classroom, community and computer-based resources” (Alberta Learning, 1996). These terms allude to the possibility of accessing online databases as one source of information but do not state it explicitly. Understandably many of us have probably read those words many times and attempted to provide students with opportunities to use such

resources. Unfortunately, there is nothing in the document itself to explain or support how to teach students to do this kind of research successfully. This being the case, the *Focus on Inquiry* document is very useful for teachers to examine.

Another interesting example can be found in a more recent revision to the Alberta Grade 10 Science Curriculum. It states “Students will use library and electronic research tools to collect information on a given topic (e.g., information on compounds we use and their toxicity, using standard references, such as the Merck Index, as well as Internet searches” (Alberta Learning, 2004). If memory serves me well, my former high school library never had access to either the print or electronic version of the Merck Index. We squeezed precious dollars just to purchase a recommended print science encyclopedia that was rarely opened and grew old and dusty on the shelves. Generally the Merck Index is subscribed to by academic libraries and is not a resource that is readily available to public schools even in 2007. Where then does this kind of recommendation leave teachers who are making every effort to provide their students with access and instruction but do not have access to the resource?

The Alberta Social Studies curriculum has undergone sweeping revision in the past four years and has been developed using a critical inquiry focus. This curriculum delineates a set of skills and processes for 21st century learners from Kindergarten to Grade 10. This curriculum is also the first in Alberta to specifically state that “Selected curriculum outcomes from Alberta Learning’s Information and Communication Technology (ICT) Program of Studies are [now] infused throughout the social studies program of studies and are indicated by this symbol ➤” (Alberta Learning, 2005). In the

section identified as *research for deliberative inquiry* for Grade 7 students can be found the following seven required ICT skills:

- plan and conduct a search, using a wide variety of resources
- demonstrate the advanced search skills necessary to limit the number of hits desired for online and offline databases; for example, the use of “and” or “or” between search topics, the choice of appropriate search engines for the topic
- develop a process to manage volumes of information that can be made available through electronic sources
- evaluate the relevance of electronically accessed information to a particular topic
- make connections among related, organized data and assemble various pieces into a unified message
- refine searches to limit sources to a manageable number
- analyze and synthesize information to produce an original work. (Alberta Learning, 2005).

Once again it must be reiterated just how complex the online search process can be for students to grasp. Yet it is a required part of the curriculum with little specific information on how to teach these skills. Some support materials in the form of an electronic *Online Guide to Implementation for Social Studies* are available to teachers at the www.learnalberta.ca website. A link to the *Focus on Inquiry* document is provided for teachers in the online guide but it is not found easily. The question would be how many teachers are aware of the content and support this document can provide in their teaching? Teacher in-service could account for some implementation of the curriculum recommendations, however, with a teacher-librarian on staff both teachers and students

stand a better chance of incorporating the information research process into daily teaching practice.

However, this recent attention to inquiry research and the ability of students to competently search online resources within the new Alberta Social Studies curriculum is a hopeful sign of what future curriculum revisions may include in all subject areas. This kind of curriculum aligns with the thinking discussed in the literature related to the need for students to understand and acquire the necessary skills they will need in the context of the research process long before they reach post-secondary education (Bodi, 2002; Manuel, 2005; Smalley, 2004).

Access to Online Databases

As mentioned in the introduction to this paper, access to online databases was formerly the domain of the corporate world. Subscriptions were costly and expert searchers were often hired to locate the information required. In the late 1980's this began to change. With the introduction of CD-ROM reference products like encyclopedias, access for schools with computers became a more reasonable prospect. By 1993 the Internet had made its public debut. It was not long until schools realized they too should be part of the 'net' scene with its steady supply of information and increasing bandwidth.

Six years ago in Alberta, a group of teacher-librarians submitted a proposal to Alberta Learning requesting funding for the licensing of a suite of online databases to be made accessible to every K-12 student across the province being taught the Alberta curriculum. Remarkably, the proposal was accepted and thus the project now known as

the Online Reference Centre (ORC) became reality. Its overarching intent is to provide access to current online reference resources thereby leveling the playing field of access for all Alberta public school students. This resource is freely available to Alberta teachers and students from school or remotely at www.learnalberta.ca.

This project is unique in Canada. No other province licenses a suite of online databases for public schools in this fashion. Some US states license specific online resources statewide for their schools, however in recent years this funding has been withdrawn and in many cases students are in danger of losing access (Bell, 2005).

I have now worked as the project coordinator for the ORC for several years. During that time I have had the opportunity to work with many teachers in the field. Despite having access to the ORC for six years now, I'm continually surprised to discover just how little awareness there is among teachers that the ORC exists. Teachers have even less understanding on their part about how to incorporate ORC resources into their teaching.

On the other hand, the most rewarding aspect of my field interaction with teachers and teacher-librarians is that once they literally get their hands on the resource there is no doubt about the value they see in sharing it with students. I have learned that telling them about the ORC is not enough. Teachers need to experience the resources in a personal hands-on situation in order for them to perceive its value for students.

At the time of writing, all Alberta schools now have high speed Internet access. Undoubtedly this capability has contributed significantly to increased use of the ORC resources. Teachers and students now have the ability to locate not only text information, but also multimedia formats such as images, video and audio clips, television and radio

transcripts, interactive learning objects and web links that require high-speed connections to deliver the information to desktops with ease either at school or remotely from home.

ORC database content is refreshed daily and covers an amazing array of subject matter. The vendors that produce these online resources continue to develop their products to keep up with their archrival *Google*. Search terms that would likely be blocked by school district Internet filtering software find appropriate hits free of advertising in online databases. Search screens are designed for novice users and offer ease of navigation with plenty of tutorial help to make searching less difficult. Students may search using either natural language or sophisticated Boolean operators. They may request search results by reading level or curriculum standard. Students now find citing sources easy since each article maintains appropriate bibliographic information that is easily copied and pasted to create accurate citation lists. There are options to e-mail articles for later access using hyperlinks back to the original documents. All databases in the ORC are compliant with assistive technologies for users with disabilities. Some databases are considering offering students the option to download pod casts of articles to an Ipod for future reference.

Many educational databases are beginning to incorporate what I like to call *teacher tools* that assist teachers in making the shift to teaching in electronic environments. For example teachers can create and store online lessons of pre-selected material and web links that students can then access directly from within the database. Some offer the capability to create teacher web pages that incorporate links back to database articles thereby supporting daily lessons.

Undoubtedly, technology is a tool that can assist in helping us find information quickly. However, a little instruction for students on how to construct and complete better online searches cannot be overlooked. Good searches in vetted online databases quickly return a plethora of pertinent, content-rich information in a wide range of formats. Having found the information quickly, students are able to spend more time grappling with the essential questions driving their research. More importantly, with just a small amount of effort, teachers can help students experience a taste of what their post-secondary schooling will entail in a much less threatening environment.

Post-Secondary Possibilities

With professors cringing at the quality of first and second year university and college student papers, academic librarians are devoting a lot of their time these days to designing information literacy programs to counter the lack of research skill capability they notice in under-graduate students. One of their main concerns is students' lack of skill when searching electronic resources.

Interestingly, the literature reports academic librarians are turning to the information research process models that have been developed for use with elementary and secondary school students for solutions to the problem. Researchers writing about information literacy with post-secondary students (Asselin & Lee, 2002; Bodi, 2002; Manuel, 2005; Neuman, 1995; Smalley, 2004) all cite Kuhlthau's (2003) information search process model as a basis for re-addressing how academic librarians and professors might best approach the obvious research shortcomings they see in undergraduates.

Bodi (2002) and Manuel (2005) identify three factors that prove most difficult for undergraduate students initiating their first research projects: (1) selecting and focusing a topic; (2) selecting an appropriate subject heading search method; and (3) assessing their search results in relation to their value for a given topic. Bodi (2002) sums up the deficit research skill ability of first-year university and college students as a “coping strategy, not an information-seeking strategy” when faced with research assignments (p. 109). Bodi (2002) makes the point that it is necessary for academic institutions to acknowledge that there is a fundamental difference between an undergraduate researcher and a scholar’s approach to research.

Today’s high school students are citizens of the digital age. They are accustomed to quick response times, instant messaging, and digital photography, cell phones that keep them constantly connected even while listening to music, and electronic social networking environments that keep them abreast of everything from gossip to daily news and fashion trends. Their expertise at manipulating these technologies seems vast, but can inadvertently set them up for a fall if they wrongly assume their command of technology translates directly to research savvy. As teachers we need to acknowledge the technology boat has sailed. We are now on stormy waters. It is time to accept that there is greater value to be gained in taking the time to teach kids more effective and efficient strategies for making research less onerous and more productive than worrying about whether we are tech savvy ourselves (Esch & Crawford, 2006; Fitzgerald, 2004; Kaptizke, 2003; Neuman, 2003; Smalley, 2004).

Taking it to the Street!

“Give me something practical that I can use tomorrow” teachers tell me when I work with them at in-service sessions for the ORC. They approach as skeptics and leave as converts. The reason this happens is that with a few keystrokes they see the rich content so easily available to them and their students. Before the session is a half-hour in, some have already let my voice fade into the background as they excitedly grab their colleagues and share what they’ve found. I hear the printer kick in and someone utter, “That’s just what I need for tomorrow’s science class on wetlands!” We practice creating lists of articles and e-mailing them to ourselves. Soon the discussion turns to how students would love the option of being able to search and share their results with teachers electronically, too. They find themselves at ease in a medium many teachers still find intimidating, particularly at the high school level.

I believe we have reached the point where technology is nearly ubiquitous in schools and that we can finally get on with doing something more than simply playing around with it. It has function and purpose in the school environment as a tool, but it has the potential to allow for so much more. Searching online databases is only one very important part of a richer, meatier information research process. The speed of access to information these days should theoretically allow for much more time to spend teaching students how to focus a topic and develop good questions that will lead them to thinking about unique and different ways to solve complex problems.

Teacher-librarians have a very important role to play in this scenario (Newman, 2003; Smalley, 2004). Schools without them will need to rely on faculty who take an interest for their students’ sake. Students and staff must be made aware of what online

databases have to offer and how to gain access to them. If you do not already subscribe to any of these resources at the school level, investigate ways to do this economically. One way is purchasing access through consortia. Check to see if you have access through a regional library system. If you teach in Alberta schools you already have access at no cost to your school!

Once access is gained, it's very important to place a direct link to these resources right on your school or school library web page. If students have remote access, so much the better since parents will then begin to realize that these resources exist. Make this clear to students and provide information on how to log in from home.

Secondly, you now need to incorporate the teaching of online search skills into your information literacy program so that students can maximize the use of the resources. Hopefully you will do this in the context of class research projects.

Many teachers that I work with are reluctant to believe that students will give up *Google* for online databases. They are not wrong in their thinking. Unless teacher-librarians and teachers can clearly model and demonstrate the value of accessing such resources in relation to curriculum and class research projects they have a difficult time convincing students of their value.

The best way to overcome this hurdle is to start small. You can simply offer students a free class to explore the databases for personal research interests. Skateboarding or *Manga* may be the order of the day knowing how much more motivated we are to conduct personal research than that which is imposed on us. Have students e-mail you three items they found useful to extending their personal knowledge of their hobbies or interests. Make sure to spend time discussing with students how the searching

went as a starting point to incorporating this kind of research into class projects. Use the students' examples to extend their knowledge of searching skills.

Once they are introduced to and can search a database reasonably well, another approach would be to require students to include at least one citation in their next reference list to come from an online database. This implies an evaluation component that is vital in creating an understanding on the part of students that one must acknowledge where their information came from. Don't hesitate to have students work in pairs to accomplish their searching. Their shared knowledge will likely go much further than trying to sort it out alone and offers opportunities to discuss what works for particular searches and what does not (Fidel et al., 1999; Marchionini, 1995; Neuman, 2003).

Reflecting on my original questions about the value of instruction related to searching online databases with students, in this case high school students, I am even more convinced that we as teacher-librarians and teachers have a duty to impart this knowledge to our students. We cannot ignore the increasing availability of information in digital formats in all kinds of libraries and on the Internet. Our students need strong information literacy skills that will support them as they grapple with difficult questions that require creative solutions with a global perspective regardless of the type of library they use for research. Having the skills necessary to leverage the enormous quantity of information stored in online databases will stand them in good stead for a long time to come.

They are not likely to acquire these information literacy skills on their own. The "emerald city" of the open Web will continue to tantalize. Without a strong commitment on the part of educators to offer alternative sources of information to consider within the

context of the research process we risk losing some very valuable teachable moments. Teaching students how to search online databases really does matter in the big scheme of things!

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