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Looking for Information-Literate Thinking in Undergraduate Subject Searching

Abstract: To what extent do upper-level, academically outstanding undergraduates employ the kind of higher-order information literate thinking during subject searching commonly associated with search and domain experts? This paper reports on a multiple case study exploration of this question involving eight students and their genuine academic subject searches over a school year. **Résumé :** Dans quelle mesure les étudiants de premier cycle universitaire aux meilleurs résultats académiques emploient-ils des techniques de littératie de haut niveau communément trouvées chez les experts lors de recherches par sujet? Cette communication présente les résultats de huit études de cas menées auprès d'étudiants suivis pendant leur cheminement scolaire au cours d'une année.

Subject searching is the process of looking for information with only a subject or topic in mind. My interest in undergraduate subject searching arose over many years' experiences in two areas: helping students with subject searching in reference desk and classroom encounters, and monitoring the development and use of their library's online catalogue. Students often seemed to find subject searching to be challenging, while transaction logs typically showed that most catalogue searches occurred in the keyword and subject indexes and many subject searches resulted in no exact matches (Graham 2004).

The crux of the subject searching problem has been characterized as "the fundamental paradox of information retrieval" since it involves "the need to describe that which you do not know in order to find it" (Hjerppe 1986, p. 221). In other words, subject searching can be frustrating if you know little about your search topic. Furthermore, the paradox may deepen if you also lack knowledge about the relevant search tools, knowledge base, and disciplinary norms. New undergraduates frequently face this situation when they tackle their first research assignments requiring subject searching.

A related issue that is also of interest is the idea of information literacy, and whether its ideals are achieved in undergraduate education. A common definition of information literacy is the ability to "recognize when information is needed and . . . to locate, evaluate, and use effectively the needed information" (American Library Association 1989). In my view, subject searching is encompassed by information literacy because needed information is frequently "about" a given topic or issue, thereby involving subject searching. Successful subject searching is therefore part of the repertoire of information literate people.

I developed a more detailed definition of information literacy that consolidates the main elements of four well-known models (Association of College and Research Libraries 2000; Bruce 1997; Bundy 2004; Society of College National and University Libraries 1999). These models all acknowledge that information literacy requires both lower order

and higher order thinking, the latter representing thinking that is sophisticated or complex, or involves a higher order of abstraction. From my detailed definition of information literacy I identified three elements involving higher order thinking that may occur during subject searching:

- using strategy to find needed information
- evaluating information, the search process and tools, and one's own thinking
- creating personal understanding of the needed information or the underlying task.

Higher order aspects of information literacy involve critical thinking, which is often considered to be one of the foundational competencies embedded in the undergraduate curriculum. We understand search and domain experts working in their areas of expertise to apply higher order thinking when they perform non-routine, complex and intellectually demanding tasks requiring subject searching. We also hope that undergraduates develop these kinds of higher order capacities as they progress through their degree programs.

While many studies have found the quality of subject searching by new undergraduates to differ significantly from that of search and domain experts, few have probed subject searching by undergraduates at intermediate points along the search and domain expertise continuums. It seems reasonable to suppose, however, that evidence of information literacy may be more easily detectable in the behaviour of senior undergraduates who are top scholars, as compared to others less experienced or less academically successful.

I therefore undertook an eight-month multiple case study to explore subject searching by Dean's Honour List students in the second half of their undergraduate studies at a Canadian university. Of 12 initial participants, 8 completed all study requirements and submitted useable data. In this paper I report on one of the study's research questions which asked: *To what extent did participants engage in the higher order aspects of information literacy during subject searching?*

Among several activities I required participants to complete was a set of three search demonstrations. Each student had to demonstrate an online subject search under my observation at the beginning, middle and end of the study. Each demonstration session involved a) talking aloud while conducting a subject search for a self-selected genuine academic task, and b) responding to a set of post-search interview questions. I used screen recording software to capture the search demonstrations and talk aloud protocols, and I audio-taped the interviews. Transcriptions were prepared for all talk aloud protocols and interviews.

To analyze the transcriptions I applied a two-step interpretive process. In step one I identified themes referencing strategy, evaluation, or creating personal understanding—the content of interest. In step two, I reduced the results of step one to themes reflecting higher order thinking—the quality of interest—which I refer to as advanced thinking. To qualify as advanced thinking a spoken thought had to seem effortful rather than rote, and convey a mindful stance. In addition, it had to reference at least one process involving higher order thinking such as weighing usual preferences against situation-specific details, or signifying knowledge of search- or task-related matters at a high level of abstraction.

Analyses revealed, on the one hand, that many advanced thinking themes pertaining to using strategy and evaluating were identifiable in thoughts voiced by every participant. In addition, I identified several themes relating to creating personal understanding in thoughts voiced by all but one participant. The greatest proportion of advanced thinking themes, by far, related to evaluating. This is notable because other studies have found undergraduate, and in some cases graduate, students to lack effective skills or confidence in evaluating during subject searching

On the other hand, while I found some instances of advanced thinking that seemed qualitatively similar to that of search or domain experts, many others, although meeting my advanced thinking criteria, did not. To seek possible patterns within these differences I further examined the identified advanced thinking themes and voiced thoughts. This process brought to light three interrelated factors that seemed to influence the proximity of advanced thinking themes to the higher order qualities characteristic of information seeking by search and domain experts.

Filtered through these factors, a refined view of advanced thinking emerged that cut across the bounds of the three information literacy elements. I characterize these groupings as advanced thinking relating to subject searching at the following levels:

- the competent student (addressing pragmatic matters of completing assigned tasks efficiently),
- the search expert (comprising technical matters about querying productively in online search tools), and
- the domain expert (involving principled, conceptual, and independently determined matters relating primarily to evaluating, creating understanding, and using information retrieved through subject searching).

In this filtered view, advanced thinking is incrementally more pronounced from the first to the third grouping as the focus shifts from pragmatic, to technical, and then to principled and conceptual matters, and the locus of control shifts from externally to internally determined matters. The greatest degree of advanced thinking is associated with the level of the domain expert. Although 'domain expert'-quality thinking represented a very small proportion of advanced thinking, it accounted for about half of all instances relating to creating personal understanding. In addition, the largest number of instances related to evaluating.

This study helps to illuminate the infrequently examined upper end of the subject searching/domain expertise continuum we hope most undergraduates traverse successfully during their academic studies. Its findings suggest that the research literature's general picture of undergraduate research and subject searching processes as being attuned primarily to pragmatic matters of discovering and meeting their instructors' task requirements, obtaining the best grade for the least effort, and using a small, familiar, simple set of strategies and tools in a rote manner is not true of all undergraduates.

Describing a portion of a recently completed investigation (Graham 2011), this paper addresses an activity instantiating the conference theme of interactions of people and places with information. Academic subject searching is an intellectual process that ideally informs students about their search topics, and leads to effective and thoughtful information use as well as successful completion of their research or learning tasks. It is

part of the larger goal of universities to ensure that all undergraduates acquire through their degree programs the ability and inclination to pursue information literate information seeking, use, and creation throughout their lives.

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