Exploring the Online Information-Seeking Strategies of Education Graduate Students

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• Results of a recent exploratory study completed in November 2013, which examines how graduate students in the College of Education at San Diego State University (SDSU) seek information online.
How they evaluate information resources will impact policy and determine the importance they place on specific informational resources.

Discovering the strategies utilized by these graduate students in their information seeking behavior will provide insight into the use of online resources and their broader information seeking-strategies.
Information seeking has been studied since the 1950s; however, previously, information seeking had only been studied in the general population.

It has only been studied in student and faculty groups in just the last three decades.

So, I am going to quickly highlight a few of the Models developed over the last 30 years and why I ultimately settled on Pirolli and Card’s Information Foraging Theory.
One of the first models in this area begins with James Krikelas study in 1983. Krikelas' model is linear in that it starts with an

1) Information need, followed by
2) the search, then
3) finding the information, and ending with
4) using the information.

However, this model is now considered too oversimplified to deal with what is generally considered an iterative process; particularly with online information seeking behavior.
A later model developed by Carol C Kuhlthau stresses a process approach with an emphasis placed on cognitive skill; as cognitive thought increases then so does information effectiveness. Her model goes beyond the actions of seeking and examines the thoughts, feelings, and actions of the seeker as they go through their process.

FEAR – UNCERTAINTY – CONFUSION – DOUBT (All the emotional elements of an information need and a Hallmark made for television movie)

Still, Kuhlthau’s model is for the most part a linear process.
A few years after Kuhlthau’s (1991) model, Byström and Järvelin (1995) drew attention to the importance of “task complexity” in information seeking.

In their model, how an information seeker proceeds depends on the degree to which they see the task as complicated.

Complex tasks are those for which a person lacks an adequate “mental model” that would enable them to judge exactly what needs to be done, or to evaluate information efficiently; such tasks are quite distinct from those of a routine variety.

The task is the starting point as well as the central component of this model.

Additionally, the Byström and Järvelin model is cyclical. Because of the cyclical nature of this model it does better address the iterative nature of a complicated Information Search Strategy (ISS) and does serve as an effective model of online information seeking behavior.

However, about the same time…
Pirolli and Card developed their theory of information foraging as an approach to analyzing human activities involving information access technologies.

In the 1970s optimal foraging theory was developed by ecologists to explain how animals hunt for food. It suggested that the eating habits of animals revolve around maximizing energy intake over a given amount of time. For every predator, certain prey are worth pursuing, while others would result in a net loss of energy. They noticed the similarities between users' information searching patterns and animal food foraging strategies.
Information Foraging Theory

SO…. <CLICK> Information foraging theory is based on the analogy of an animal … um… perhaps a library patron…

<CLICK> deciding what to eat (ie. an information need or task)

<CLICK> where it can be found, the information patch or resource used,

<CLICK> the best way to obtain it (ie. search strategy)
<CLICK> and how much energy (ie. time spent searching… or fighting with) the meal will ultimately provide
There are two key concepts to foraging theory

The most important concept in the information foraging theory is *information scent*. As animals rely on scents to indicate the chances of finding prey in current area and guide them to other promising patches, so do humans rely on various cues in the information environment to get similar answers.

Human users estimate how much useful information they are likely to get on a given path, and after seeking information compare the actual outcome with their predictions. When the information scent stops getting stronger (i.e., when users no longer expect to find useful additional information), the users move to a different information source.

**Information Diet:** On the Web, each site is a patch … and information is the prey.

Decisions are made to pursue one information source over another. In other words, you as an information forager are looking for a nutritious meal and one that is easy catch. (For example in our previous slide of the scared – plump rabbit vs. the Rambo Rabbit which made the search a little more complicated.)

So, Pirolli and Card’s information foraging theory forms the conceptual framework for this study, because of its focus on online searching for information.
The Study

• The students were contacted through an emailed survey/invitation participate sent to them through the SDSU College of Education.
• These responses were evaluated and sample participants were invited to continue.
• Qualitative techniques were used; including use of journaling protocols and key logger software to record the participant’s computer use to answer predetermined research questions.
• Categorical aggregation and grounded theory was used to analyze and speculate on the participants’ information seeking behavior.
685 emails sent

259 were opened.

My survey was open more often than the Account Average! Yay!
And of the 259 who actually opened the email – I got a total of 90 respondents; 90% Confidence MOE +/- 8.7%. Thank heaven I’m in the Social Sciences!

Of the 90 respondents, 69 were in a Masters program, and 21 were in the Doctoral program.

Of the 90 respondents, only 54 of them were willing to continue with the study. ($50.00 incentive)
12 participants were ultimately asked to participate in the second part of the study; using voluntary sampling until information saturation was achieved.

Questionnaire was composed of mixture of both factual questions and interpretive tasks.

Participants were provided with a Key logger thumb drive, questionnaire, and protocol to address if they used personal knowledge to answer a question and record notes they felt were relevant to their searches (to reduce the Observer effect).

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A factual question is “asking a fact”, such as naming, identifying, or listing. FOR EXAMPLE Who is the author of this book?

An interpretive task is a “thinking/understanding and searching” task, that is, a task to configure an answer rather than simply and concisely locate one. There can be more than one correct answer. FOR EXAMPLE Who are three leading researchers in your field of study?

The STUDENTS were provided with a Key logger thumb drive, questionnaire, and protocol to address if they used personal knowledge to answer a question --- and record notes they felt were relevant to their searches.

All in an effort to reduce the Observer effect... of having a librarian on their shoulder and therefore feeling compelled to use library resources to answer questions.
There was a recurring pattern among the subjects typified by Subject #2 here.

Subject #2 represents the typical information scent and patch changes made by the majority of the subjects asked to participate in the study.

Though the order was not always the same --- and there was some variation of information patches used. There was a diversity of resources used – in terms of the kinds of online resources used – various search engines (Google most commonly), library resources used, private websites (Amazon, Barnes and Noble), and free and government websites.

And this is great. This is the kind of search behavior we want to see. Use of diversity of resources… confidently moving from information patch to information patch to answer questions.

However…
There were also two participants out of the twelve subjects who got incorrect answers.

Subject #1: Masters Student, in program 3 mo., Full-time student, works in Educational field

Subject #9: Masters Student, in program 3 mo., Part-time student, does not work in Educational field

The two who got incorrect answers were both in the MA program for only 3 months. This could indicate a lack of information instruction. There was the attempt to use the library resources by Subject #1, but the student kept returning to Google Scholar after selecting various Library databases. She certainly wasn’t sure where the information scent was much of the time. There was a tremendous amount of energy and time spent searching relative to the other participants in general. She also represents the largest number of information patch changes of the entire group. (obviously trying, expending a lot of energy, lack of confidence in resources chosen)

The second one (subject #9) was clearly thinking she had a strong information scent; however, she made the most mistakes. She also represents a member with the fewest information patch changes. She is also a member of a group of four that did not use any library resources to answer the questions. Three of the 4 were Masters Students; the other was a Ed.D. student in his first 3 months of the program. (low energy spent searching, no diversity of information patches)

The common element in these two students who gave incorrect answers was being “NEW” to graduate school. (No librarian contact or research methodologies class). However, the difference in energy expended between #1 and #9 may be explained by what they don’t have in common… one currently works in an educational field – and one does not… one is currently enrolled full-time – and one is not.

We are going to see Subject #9’s pattern mirrored in the other 2 Master’s students’ and Ed.D. student’s information scent as well.
The other two Master students only shared that they were in the same program, both part-time, and both had been in the Masters program **more than three years each**. Both of these students had been in their program longer than any of the other subjects had for this study. In all four of the cases the subjects used personal knowledge to answer the questions more than any other subject.

In the case of the Ed.D. student he used personal knowledge about researchers he was exposed to during his masters program, not from his Education Leadership program.

As an aside: Subject #10 Described herself as the Queen of Google.

Also, of the interpretive tasks that were given: Though technically correct answers were given by these three subjects... the answers were decidedly **unambitious**. Like I said of the Ed.D. student... using previous research in his previous field of study to answer the question --- name 3 top researchers in your field of research --- it was not incorrect, but did go against the spirit of the question.

Other examples were answers to the question “List any 3 current books in your area of study” and then listing 3 books all by exactly the same author and then using this same author to answer the “name two researchers in your field of study”.

Also in another question “List any 3 current (from 2003 to 2013) articles on pedagogical practice (or approaches) to Information Literacy”: incomplete citations where given.

What might have contributed to the quality of the answers? Well, we know that these four subjects relied on their personal knowledge. The shared traits were either less than 3mo. in the program or over 3 years in the program and part-time enrollment.

There appears to be evidence of either a lack of librarian contact or research methodology contact – or there has been a span of time between the subject’ s last contact with a librarian or a research class.
Finally, there is the Subject #6, who strongly detected information scent and navigated to specific resources to answer his questions.

What is remarkable about this is that he varied his search strategy, not his patch. He was certain that he was looking in the right area, but just needed to adjust his strategy. He was the only student to adjust his search strategy in this way.

The other education students tended to pinpoint specific words or a sentence rather than extrapolate or infer to answer questions.

Switching out STEM, ENGINEERING, SCIENCE – using additional terms to refine his search like transition, persistence, education, higher education, college, and research.

He is in stark contrast to Subject #12. Both are first year Ed.D. students and both have Masters degrees, both recently earned (however, Subject 6’s masters was in Education). And subject #6 currently works in the Education field and Subject #12 does not. However, there are other Ed.D. students both working in and out of the educational field that had the more typical behavior using a mixture of online academic resources, a general search engine, and one or two specific websites.
Conclusions

• “Part-time enrollment” and being a “1st Semester Student” generally reduced the number of information patches searched and was always at least one of two factors present in those students who relied on their own “Personal Knowledge” to answer a question.

• Being a “1st Semester Student” was always a factor in incorrect answers to factual questions.

• The quality and accuracy of the answers of those students who relied heavily on either Personal Knowledge or relied exclusively on an Internet Search Engine tended to be poorer or simply incorrect answers.

• Searching behavior appears to improve in terms of strategy and awareness of other information patches as graduate students continue through their program. However, there also seems to be an effect of program intensity, where those students who have spent a longer than usual time period in the graduate program exhibit a reduction in information strategies used and information patches consulted.

• All of the students (but one) failed to adjust their search strategies when confronted with limited search results.
A Couple of Strategies for Improving Information Seeking

- Early contact with Graduate Students on how to perform library research, within first couple of months.
- Slow speed of progress through the graduate program appears to potentially negatively impact information seeking behavior. Part-time students need consistent contact and refreshing of searching and research skills.
- Effective search strategies need to be reinforced and emphasized in information literacy sessions. Adjusting language along with search locations.
What I’d do differently

Additional demographic data:
- Time between undergraduate and graduate school.
- What was their undergraduate degree in? (only asked about graduate education)
- When was the last time you had information literacy or library instruction?
- How long has it been since you’ve had a research methodologies course (if ever)?
Thank you!