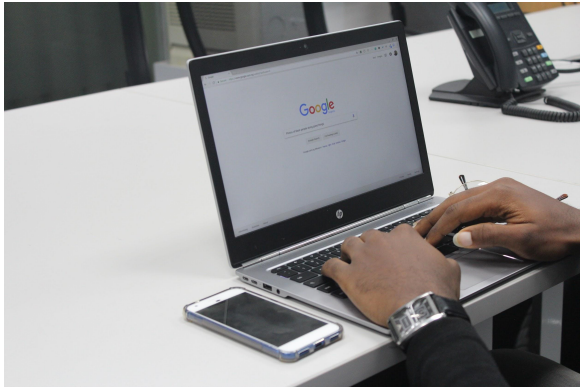
Understanding users' learning while searching with the help of varying task complexity



Funding agencies:

INSTITUTE of Museum and Library SERVICES

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Objective

In this research we investigated the **relationship between searching and learning** by conceptualizing information seeking as an outcome of the information seeking process.

Role

As a doctoral researcher, I conducted remote user studies to understand insights into how users learn based on how users search information online.

Team

Collaborated with fellow graduate students, software engineers, supervisor

Duration

Jan, 2017 - Dec, 2017

Skills and Tools

Tools: R, MySQL Workbench, MS Office

Skills: User-studies, Statistical Analysis, Contextual Inquiry, Interviews

Research Questions

RQ1: What are the different search behaviors that may be observed as people engage in the various tasks associated with the cognitive taxonomy of learning?

RQ2: What is the relationship between the perceived learning processes and outcomes during a search process and the levels of cognitive complexity?

RQ3: What are different actions related to learning which may be observed as the users engage in the various tasks associated with the cognitive taxonomy of learning?

Process: Method

The study steps include:

- Students were provided study instructions regarding filling up the questionnaires and task completion. Along with installation and use of **Coagmento (browser-based extension to capture users' log data and responses filled by participants)**
- Users presented asked to complete learning oriented tasks designed based on Bloom's Taxonomy (Remember/Understand, Apply, Analyze, Evaluate). Each task was preceded by a pre-task questionnaire followed by a post-task questionnaire to assess users' perceived difficulties and usefulness; along with measures such as task complexity, topic familiarity. Also at the end of each task users were asked to select the action verbs that were associated to each of the four tasks. While completing these tasks, users were asked to make use of different information sources such as online sources or offlines sources such as friends or family. At the end of the study an exit interview was conducted.

Duration: **2 weeks under a field study environment**
Participants: **31 (Undergraduate Rutgers students)**

Process: Method

Task 1: (Remember and Understand): What is cyber bullying? How is it similar or different to other types of harassment (e.g. cyber bullying vs. traditional bullying)? What are some long-term/short-term risks involved with cyber-bullying?

Task 2:(Apply): In 2010, Rutgers University witnessed the tragic incident of Tyler Clementi, whose case raised concerns about cyber-bullying. Find out more about this case, and possibly some other cases. What does/do this/these case(s)?

Task 3: (Analyze): Having heard some of the recent reports on cyber bullying, what seems to be the main cause of the bullying behavior online? How much is technology and the use of electronic communication associated with cyber bullying? Why?

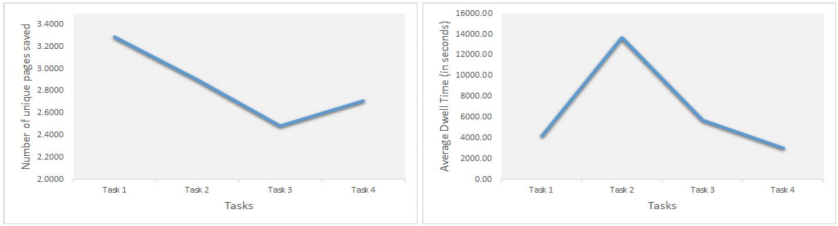
Task 4:(Evaluate): How effective are some of the currently available strategies to mitigate cyber bullying at schools and university campuses? Why? Which strategy/method do you think is best and why?

Process: Analysis

We presented users search tasks designed on different cognitive levels of learning based on revised Bloom's Taxonomy. With the help of users' search behavior using **search logs (dwell time, unique pages visited, unique pages saved, no. of queries, query length, query diversity, query reformulations).**

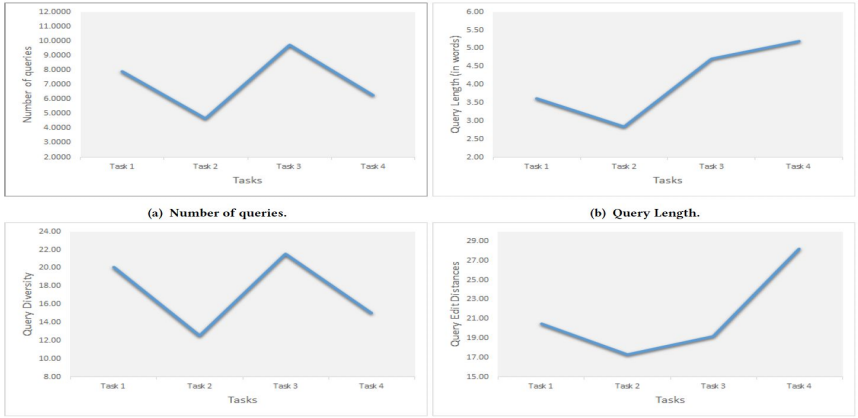
We performed quantitative analysis to understand users' learning outcomes. Moreover, with the help self-reports, interview data we inferred searching and learning as co-existent processes.

Results



(a) Unique pages saved. (b) Average Dwell Time.

Figure 1: Page-specific search behaviors based on task complexity levels.

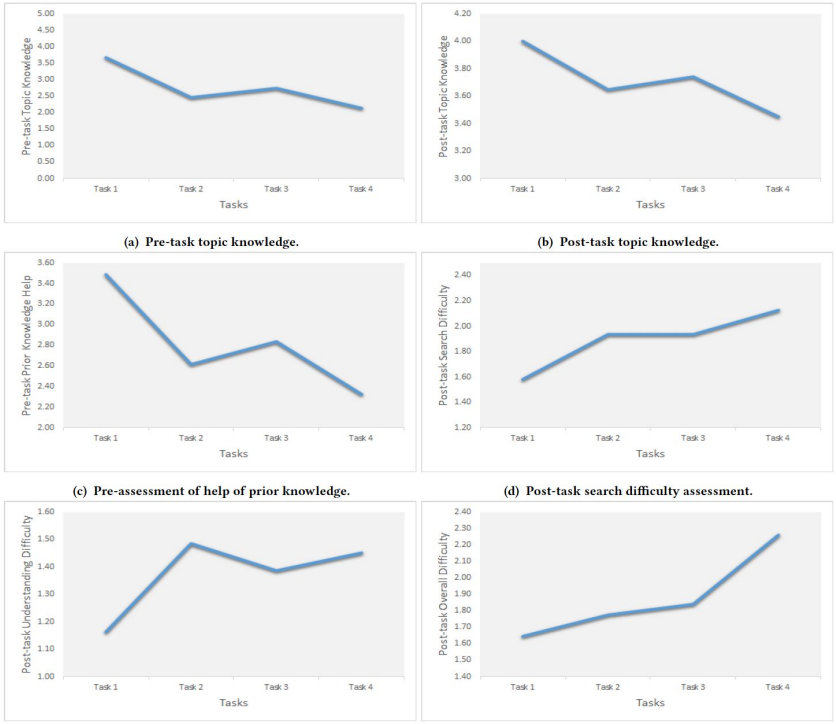


(a) Number of queries. (b) Query Length.

(c) Query Diversity. (d) Query Reformulations.

Figure 2: Query-specific search behaviors based on task complexity levels.

Results



(a) Pre-task topic knowledge.

(b) Post-task topic knowledge.

(c) Pre-assessment of help of prior knowledge.

(d) Post-task search difficulty assessment.

(e) Post-task understanding difficulty assessment.

(f) Post-task overall difficulty assessment.

Figure 3: Learning outcomes based on task complexity levels

(a) Task 1 (Remember and Understand).

(b) Task 2 (Apply).

(c) Task 3 (Analyze).

(d) Task 4 (Evaluate).

Figure 4: Top learning actions for each task.

Outcomes

It was found there was no relationship between users' different search behaviors associated with the different learning tasks completed by them.

It was inferred users' perceived increase in knowledge is related to their topic interest presented for each of the tasks.

It was noted different action verbs such as Distinguish, Organize, and Conclude were most frequently used action verbs for each of the four tasks. Similarly, other action verbs for each of the tasks include:

Task 1: List & Define

Task 2: Relate & Demonstrate

Task 3: List & Relate

Task 4: Demonstrate & Relate

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More information

For detailed information about the topic refer the following papers:

https://dl.acm.org/doi/10.1145/3176349.3176386

https://dl.acm.org/doi/10.1145/3176349.3176890

https://link.springer.com/article/10.1007/s10791-017-9315-9