

Editorial

Recent advances on searching as learning: An introduction to the special issue

Journal of Information Science
2016, Vol. 42(1) 3–6
© The Author(s) 2016
Reprints and permissions:
sagepub.co.uk/journalsPermissions.nav
DOI: 10.1177/0165551515614473
jis.sagepub.com


Preben Hansen

Department of Computer and Systems Sciences, Stockholm University, Sweden

Soo Young Rieh

School of Information, University of Michigan, USA

I. Introduction to the topic

Although information searching is one of the most popular online activities people engage in for a variety of goals and tasks every day, search systems have long been viewed from a rather limited perspective. That is, search systems have been typically viewed as tools for retrieving online content to satisfy information needs. However, today's search systems support people's interactions with information and help people access and use information in ways that go beyond offering a set of search results for specified search tasks. Despite the fact that information search systems have evolved from information-retrieval tools to full-text information-intensive systems over the past two decades, researchers have only recently started recognizing search systems as rich online spaces in which people can learn and discover new knowledge while interacting with online content. This does not mean that searching and learning have not been seen as connected in the field of information science. In fact, there have been numerous studies on the intersection between searching and learning. However, the association between searching and learning has often been defined in terms of searching in the learning environment, having learning as a search goal or learning about searching, focusing on teaching search and evaluation skills to youth. As a result, the concept of learning has often been assumed rather than clearly being articulated in most information science studies.

A new research direction we present in this special issue is 'Searching as Learning', which attempts to move away from rather simplistic conceptualizations either as searching to learn or learning to search. From the perspective of searching as learning, we propose to reconsider the value of search systems in supporting human learning directly while focusing on the impact, influence and outcomes of using search systems with respect to a learning process. We believe that there are great opportunities to leverage and extend current search systems to foster learning by reconfiguring search systems from information-retrieval tools to rich learning spaces in which search experiences and learning experiences are intertwined and even synergized.

The idea of studying and designing search systems to foster learning during the search process and create a rich learning space has been attracting growing recognition among researchers and practitioners in recent years. This Special Issue is a follow-up to the Searching as Learning (SAL 2014) workshop (<http://www.diiigubc.ca/IIIXSAL/index.html>) held in conjunction with the Information Interaction in Context (IliX) Conference (<http://iiix2014.ur.de/>) in Regensburg,

Corresponding author:

Preben Hansen, Department of Computer and Systems Sciences, Stockholm University, Sweden.
Email: preben@dsv.su.se

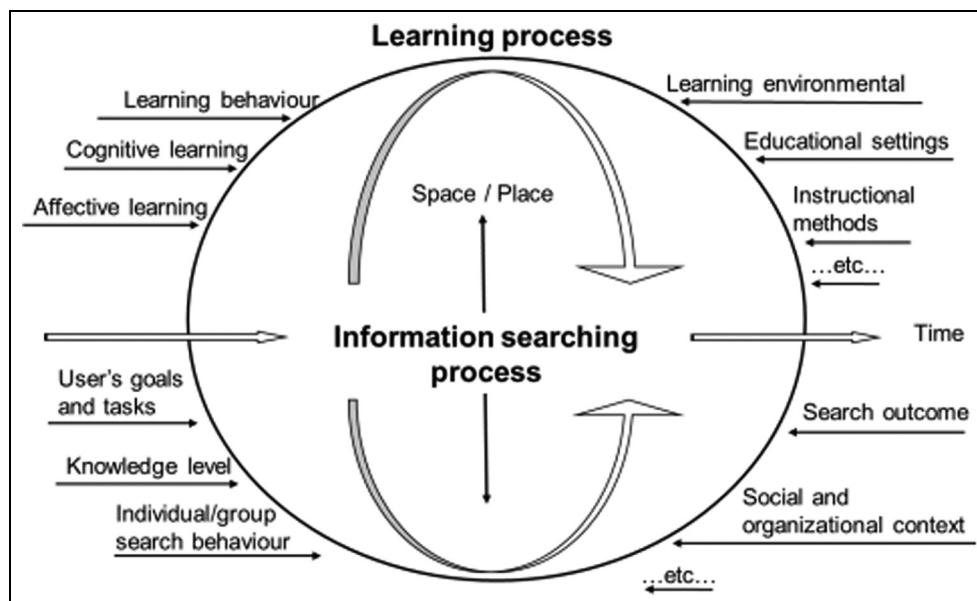


Figure 1. Information searching and learning factors influencing searching as learning.

Germany in August 2014. There were also discussions about the intersection between searching and learning in two previous workshops. At the SWIRL 2012 (The Second Strategic Workshop on Information Retrieval), participants proposed ideas about the ways in which information retrieval systems need to play a more central role in supporting learning processes and experiences through a variety of tools, and how to teach search strategies to support learning. At the 2013 Dagstuhl Seminar on Evaluation in IR, participants discussed future research directions, moving ‘from searching to learning’, that emphasized the importance of learning as a search outcome. The goal of the discussions in these two venues was to develop a robust research agenda on the topic of Searching as Learning.

The goal of this Special Issue is to present theoretical and empirical research that addresses a variety of issues related to searching as learning. In order to illustrate the complexity and dynamics of the perspective of searching as learning, we describe the processes of searching and learning in Figure 1. Learning itself is multifaceted and involves a number of factors that may affect searching. For the information-searching process, we can include aspects such as user goals/tasks, user’s knowledge level, search outcome along with search situation, individual and group search behaviour, and social and organizational context. Regarding the learning process, we may identify factors such as cognitive learning, affective learning and learning behaviour. In addition, instructional methods, educational settings and learning environments can also influence human learning processes associated with searching. Multiple factors from both of these parallel, co-existing processes can be investigated at specific time and space/place instantiations. For example, different spaces are situated in places, and these spaces can be both digital and physical. This means that spaces can become places that are not just physical containers for human activities, but also physical or digital locations where complex social interactions occur, such as learning and searching processes. In summary, Figure 1 illustrates a possible set of factors related to a perspective on the searching process as a learning process. Furthermore, the purpose of this figure is to highlight that these two processes co-exist and are intertwined with each other both in space/place and in time. At any given time and in any given space/place, co-existing searching as learning processes can be studied, focusing on one or more of the factors involved. Once we recognize that these processes co-exist, new kinds of research data can be collected and analysed, which will lead to identification of new phenomena involved in searching as learning.

2. Papers in this special issue

In this special issue, we present papers that provide insights or empirical findings that can advance research issues associated with searching as learning. The range of topics included in this special issue illustrates the variety of themes and methodological approaches taken in this area.

The first paper in this special issue on searching as learning is written by Pertti Vakkari, from Tampere University, Finland, with the title, ‘Searching as learning: A systematization based on literature’. As the title suggests, Vakkari attempts, based on a literature survey of research reporting on empirical studies, to create a systematic categorization of

dependent and independent variables in these studies. Before doing that, Vakkari also provides suggestions regarding how learning occurs in searching processes. A main theme in the article is that learning is conceptualized as ‘changes in one’s knowledge structures’. In some learning theories, learning is described in terms of knowledge structures (or mental models or schemas), and then learning may imply *gaining new or modifying and reinforcing existing knowledge structures*. Based on constructive search processes like Kuhlthua’s ISP model, Vakkari claims that, if we better know the reasoning behind search activities such as term selection and relevance assessment, it will help us in our understanding of searching as learning. Vakkari points out that it is not enough just to provide a user with a high-quality results list; users also need tools that help make sense of their results, structuring and manipulating search results and sources to aid them in tuning their knowledge structures. These insights provide system design with new challenges and require the development of new evaluation indicators.

The second paper, ‘Towards search as a learning process: A review of current perspectives and future directions’, is another literature review, written by Soo Young Rieh (University of Michigan, USA), Kevyn Collins-Thompson (University of Michigan, USA), Preben Hansen (Stockholm University, Sweden) and Hye Jung Lee (Institute for Education and Innovation, Republic of Korea). They propose a new perspective on searching as a learning process, moving away from the perspective of searching as a learning tool. From this perspective, Rieh et al. present a new framework, comprehensive searching, which refers to a variety of search activities that support individuals’ critical abilities to apply, analyse and evaluate, and also facilitate their creative learning to develop new ideas directly. In addition, they discuss how search interaction data can provide an enriched representation of user goals and search processes that is critical for characterizing, understanding and assessing search-related logs, and eventually developing future search systems. In conclusion, they present opportunities and challenges with respect to future research directions and agendas.

Rebecca B. Reynolds, from Rutgers University, USA is the author of the third paper, entitled ‘Relationships among tasks, collaborative inquiry processes, inquiry resolutions and knowledge outcomes in adolescents during guided discovery-based game design in school’. The article reports on a study of US middle school students and their collaborative information-seeking and knowledge-building practices in a constructionist blended-learning setting, and in game design teams. The study focuses on the relationship between processes and learning outcomes, among other things. Data from six team cases using a coding scheme of categories for the concepts of task, collaborative information seeking (CIS) modality and inquiry outcomes was used. The results demonstrate that student tasks, CIS modalities and inquiry outcomes appear related. The study also considers linkages between processes and learning outcomes. The article concludes by saying that new scholarly knowledge emerging from the relationship between the learning sciences and information sciences may have a good potential to generate new scholarly understanding.

‘Process patterns and conceptual changes in knowledge representations during information seeking and sensemaking: A qualitative user study’, written by Pengyi Zhang, Peking University, China and Dagobert Soergel, Buffalo University, USA, is another paper that deals with the construction of knowledge representations as learning, but this time during a sense-making process explicitly. It focuses on the conceptual changes to knowledge structures that take place in different ways. Guided by a cognitive model, the authors report on a study investigating the evolution of the knowledge structures of participants engaged in news writing and business analysis tasks. The authors found that the sense-making process comprises several components, that there are three classes of evolution of the conceptual changes (accretion, tuning, and restructuring) and, finally, that the changes in knowledge representations support the sense-making process.

Three faculty from the iSchool at the University of British Columbia, Canada, Luanne Freund, Rick Kopak and Heather O’Brien, offer a paper called ‘The effects of textual environment on reading comprehension: Implications for searching as learning’, which reports on the results of an experimental study investigating the effects of the textual environment on comprehension and learning. They manipulated two factors in the presentation of text: presentation style and interactivity. Comprehension was a primary outcome measure used in their study. Results demonstrate that comprehension is affected by the manner in which text is presented and by the tools available to the reader to interact with text. Although this study is about reading and comprehension assessment, and the authors present a case that reading is a core component of searching. In their conclusion, they identify implications of their study for designers and developers of search systems for which learning is an explicit goal.

The article entitled ‘Performance of computational cognitive models of web-navigation on real websites’ is written by Saraschandra Karanam (Utrecht University, The Netherlands), Herre van Oostendrop (Utrecht University, The Netherlands) and Wai Tat Fu (University of Illinois, USA). They compared the performance of two computational cognitive models, CoLiDeS (Comprehension-based Linked Model of Deliberate Search) and CoLiDeS+ on two real websites under two conditions of task difficulty (simple and difficult). CoLiDeS, which is based on the Construction–Integration model of text comprehension, assumes that information seeking and navigation are driven by text-comprehension and problem-solving processes. CoLiDeS+ incorporates contextual information into its modelling, assuming that the surrounding context helps a user build a mental representation of the information space to be navigated. They found that

CoLiDeS+ predicted more hyperlinks on the correct path and had a higher path completion ratio than CoLiDeS. They also found that inclusion of context from previously visited pages and implementation of backtracking strategies led to better modelling of performance. Their work demonstrates that providing accurate support during navigation is indeed beneficial in enhancing information-seeking performance.

We hope that the six papers selected for the special issue will contribute to the advancement of searching as learning.

Acknowledgements

We would like to thank the Editor of the *Journal of Information Science*, Adrian Dale, for his support in producing this special issue. Special thanks go to anonymous reviewers who provided their time and expertise in reviewing papers.

Guest editors

The following researchers served as guest editors for this special issue:

Preben Hansen

Department of Computer and Systems Sciences
Unit of Interaction Design and Design for Learning
Stockholm University, Sweden
Email: preben@dsv.su.se

Luanne Freund

School of Library, Archival and Information Studies
University of British Columbia, Vancouver, Canada
Email: luanne.freund@ubc.ca

Jacek Gwizdka

School of Information
University of Texas at Austin, USA
Email: jgwizdka@acm.org

Jiyin He

Centrum Wiskunde & Informatica, the Netherlands
Email: he@cwi.nl

Noriko Kando

National Institute of Informatics, Japan
Email: kando@nii.ac.jp

Soo Young Rieh

School of Information
University of Michigan, USA
Email: rieh@umich.edu