The actuality of determining information need in geographic information systems and science (GIS): A context-to-concept approach

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A B S T R A C T

Although context has been identified as the key to the manifestation of information literacy (IL), little is known about the actual context of IL in disciplinary areas. This is because disciplinary studies of IL have focused mainly on people's conceptions of IL, not on their lived teaching and learning practices. Introducing university assignments as a contextual construct for disciplinary studies of IL, this study demonstrates how students' and educators' conceptions and experiences of real university assignments and their constructive participation in conceptualization of IL helped to uncover the actual nature of information need in the discipline of geographic information science/systems (GIS) and to gain a better understanding of the concept of, and requirements for, determining information need in this discipline. Adopting an embedded case study design and a participatory approach for fieldwork, the data were mainly gathered from 27 semistructured interviews focused on GIS students' and educators' lived experiences of university assignments and their reflections on various aspects of IL in a master's degree GIS program jointly delivered by universities in the UK and USA. Each learning and teaching experience was treated as a unit of analysis. GIS assignments were found to be geospatial, technology mediated, subject free, and unique in requirements. Each characteristic uncovered a new facet for the concept of information need in GIS. Findings indicate that unless students have understood the multi-faceted nature of information need, they may fail to distinguish the various ways in which gaps may be addressed when dealing with GIS assignments. The context-to-concept approach proposed in this study can be of value to both IL researchers and practitioners who seek deeper insights into the nature of IL, especially those interested in the customization of generic models of IL to the actual needs of university programs.

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1. Introduction

Context has been highlighted as the key to the manifestation of information literacy (IL) (Dorner & Gorman, 2011; Hoyer, 2011; Leckie & Fullerton, 1999; Lloyd, 2006, 2007; Nazari, 2011; Nazari & Webber, 2012; Webber, Boon, & Johnston, 2005; Wu & Kendall, 2006). However, methodological practices that focused more on the phenomenon and not on the context within which the phenomenon is experienced have resulted in a dearth of deep insights into the actuality of IL as practiced in real-life university programs. Instead of focusing on people's experiences of IL, as is the dominant approach in those types of exploratory studies, the present study offers a context-to-concept approach which recommends studying people's experiences of the contextual constructs of the phenomenon. It conceptualizes the nature of information need and the process of determining information need in the study of geographic information science/systems (GIS) as observed from students' and educators' learning and teaching experiences of GIS assignments in a real-life GIS program.

2. Problem statement: need for moving from "typicality" to "actuality" in the disciplinary research of IL

Higher education models of information literacy have been designed to help students dealing with their information need when accomplishing assignments or learning a subject. However, the methods and approaches used to discover the actuality of the information need across disciplines do not address the actual nature and characteristics of the university assignment as experienced in real-life university programs (Julien, Given, & Opryshko, 2013). Many of the IL standards and curricula listed on the Association of College and Research Libraries (ACRL) IL wiki (Association of College and Research Libraries, 2014) are the result of community meetings representing librarians' and disciplinary educators' perspectives of a typical assignment, rather than an actual assignment. Addressing the complexity of an actual assignment requires a different path, a context-to-concept approach, to understand the real IL needs of students across the discipline. By exploring the actual learning and teaching practices of a subject in a real-life university program, it is possible to move away from the typicality of what has been defined as university assignments across disciplines, and to see the actuality of the assignments as experienced or

reported in a university program. Taking a context-to-concept approach, this study focuses on the participants' actual learning and teaching practices of student assignments, as a key contextual construct. Students are asked to reflect on various aspects of IL, including determining information need. Constructive participatory methods can be very effective in the design of fieldwork questions. Instead of focusing on people's experiences and conceptualizations of IL (phenomenon/concept), as is the dominant approach in IL research, the focus is on the contextual constructs (context) around which the participants' experience of the IL is developed.

Lack of understanding of the actual nature of university assignments in university programs may lead to failure to address the real information and IL needs of students across disciplines. Taking the context-to-concept approach becomes even more important when seeing IL as a socio-cultural practice and a contextual phenomenon for which reality is shaped by the educational, cultural, and other contextual constraints within which the experience and practice of IL take place (Wang, Bruce, & Hughes, 2011). Understanding how students accomplish their projects and how educators expect students to address their project requirements provides a useful evidence base for understanding the context for which the building blocks of IL are constructed. Such contextual understanding of IL, then, provides stakeholders with the insights they need about the actual nature of IL and the way it should be customized for the needs of specific disciplines and be integrated into the curriculum.

This study addresses two main questions:

- What are the nature and characteristics of GIS university assignments? What requirements do they need to be accomplished?
- What do the characteristics and requirements of GIS university assignments tell us about the nature of information need and determining information need in the GIS discipline?

3. Literature review

According to prevailing higher education models of information literacy (e.g., Association of College and Research Libraries, 2000; Society of College, National and University Libraries [SCONUL], 1999), the very first task of IL is recognizing that there is a need for information and determining the nature and boundary of this need. In the ACRL standards, the most used framework by universities worldwide, this area of IL competency has been identified as the ability to determine "the nature and extent of the information needed" which requires students to:

a. define and articulate the information need,
b. identify a variety of possible source types and formats,
c. assess costs and benefits of obtaining the information, and
d. reevaluate the information need.

Similarly, in the SCONUL model, this area of IL competency has been defined as the "ability to recognize a need for information" and the "ability to distinguish ways in which the information gap may be addressed" (Webber, 2008).

In both frameworks, and other generic models of IL, information need refers to a knowledge gap addressed in a typical university assignment (e.g., an essay), and it is usually met by the use of some textual resources such as books, journals, databases, web resources, and more recently wikis, blogs, YouTube videos, and so on. However, several disciplinary studies of IL (Boon, Johnston, & Webber, 2007; Leckie & Fullerton, 1999; Williams & Wavell, 2006; Wu & Kendall, 2006) suggest that the IL needs of students differ from those identified in the generic models of IL. For example, Webber et al. (2005) explain that the IL needs of students are conceptualized in the faculty members' meaning of information in the subjects they teach as well as the "internal and external factors (e.g., the nature of learning tasks and employment

expectations) informed by the nature of disciplines" (Nazari & Webber, 2010, p. 335). This study focuses specifically on the academic study of GIS, which has been defined as a combination of "science" and "geospatial technology". GIS as science is "a multidisciplinary research enterprise that addresses the nature of geographic information and the application of geospatial technologies to basic scientific questions" (DiBiase, Demers, Johnson, Kemp, & Luck, 2006, p. 5), and GIS as geospatial technology is "the specialized set of information technologies that handle georeferenced data [from] geospatial sensing, land surveying, and global navigation satellite systems, to data analysis (e.g. software for statistical analysis and modelling) to display and output (e.g. geovisualization software and imaging devices)" (pp. 5–6).

Due to the interdisciplinary and technology-oriented (hence evolving) nature of GIS and the geospatial nature of information in this discipline (DiBiase, 2008; Nazari & Webber, 2010; West, 2008), the types of learning tasks that students have to deal with are more complicated than in most other disciplines. When seeing this complexity in the context of generic models of IL, it becomes very obvious that the typicality of university assignments assumed in these models does not address the actuality of the projects that GIS students have to deal with throughout their course of study (Nazari & Webber, 2012) and after graduation, at work (Baker & Bednarz, 2003; Environmental Systems Research Institute, 2002; Gold, 1989; Goldin & Rudahl, 1997; Kemp, 1994). This is also evident in the studies that have examined generic models of IL in GIS education (Jablonski, 2004; Massey, 2002).

Even in customized versions of the ACRL IL standards, the actual nature of real-life university assignments has not been considered when IL is adopted for specific disciplines, including GIS. This is because the customized versions of IL have been mainly grounded on the opinions of some group of experts rather than on empirical research in actual university programs. For example, in the science, engineering and technology disciplines, similar to GIS, the influence of the interdisciplinary and changing nature of these disciplines on the types and formats of information resources used in these disciplines has not been addressed in revisited standards in several areas. The ALA/ACRL/STS Task Force on Information Literacy for Science and Technology has highlighted the need for "knowledge of information resources in more than one discipline", knowing "how to keep up with new developments and new sources of experimental/research data", and the need for accessing a broad range of information resources in various different formats that are usually costly and need "manipulation and a working knowledge of specialized software, …[such as]…multimedia, database, website, data set, patent, Geographic Information System, 3-D technology, open file report, audio/visual, book, graph, map" (ALA/ACRL/STS Task Force on Information Literacy for Science and Technology, 2009). Although these, to some extent, address some disciplinary characteristics of GIS, they do not reflect the actuality of students' projects in real-life university programs. For a holistic view of the actuality of IL in the disciplines, this study suggests a different departing point in the design of the fieldwork; a context-to-concept approach. Adopting an embedded exploratory case study design, this article demonstrates how the design considerations, especially in the fieldwork phase of the study, facilitated the illumination of the actuality of IL in a GIS university program and that how these considerations supported the transferability of the emergent results.

4. Methodology

4.1. Design: an embedded single case study

The study adopted an embedded exploratory case study method in order to gain a holistic and in-depth understanding of the actuality of IL in a real-life university program through the exploration of the teaching and learning experiences of university assignments embedded in a GIS program. The case was a joint master's degree GIS program delivered online by the universities of Leeds and Southampton in the UK,