

Geo-information literacy: a necessary component of the Map/GIS Libraries

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The rapid technological changes in cartographical applications and information systems favoured the widespread use of geographical information in human's everyday life. Map/GIS libraries maintain a variety of materials in print and electronic form while offering a range of services to their users, -experts and/or not - in order to meet their various information needs. The continuous spread of digital cartography along with the complex approaches to the analysis of geospatial data both in academia and in the daily life of the citizens requires ensuring the correct and maximum use of geo-library collections. Additionally, the incorporation of technology and services in the library daily work affect how librarians keep up with the instruction and training they provide to their users.

User education and the development of information literacy programs in libraries is not a new concept, but it is a long-standing, and a traditional component of their function. According to ALA (1989) to be information literate, a person must be able to recognize when information is needed and have the ability to locate, evaluate and use effectively the needed information.

The purpose of this paper is to raise awareness amongst librarians in their involvement in user's education programs and in communicating their geo-collections. The paper examines concepts and definitions related to user education, explores how significant Map/GIS libraries approach information literacy and what methods are used for this achievement to be accomplished. Furthermore, the paper underlines the role of the Map/GIS librarian and the necessary skills that he/she must have in order to successfully fulfil his educational duties.

Key words: geo-information literacy, geo-collections, user education, spatial literacy, Map/GIS Librarian skills, geo-information literacy methods

1. Introduction

Libraries are dynamic organizations. They are constantly changing in order to efficiently act not only as keepers and preservers of the print materials but also to become service providers, facilitators of information and lifelong opportunities, technology providers, safe and central public spaces, research assistants. Equal access to information is critical for citizens to participate in a democratic global community as educated and informed citizens (Krolak, 2005; ALA, 2022¹). The purpose of Map/GIS libraries is focused on the access and use of the geographical information (Boxall, 2004).

Geographic information has traditionally been disseminated through particular media as well as verbal and written text (Miller, Keller and Yore, 2005). Geographical libraries may include a variety of materials: maps and atlases (manuscript, rare printed and digital), charts, aerial photos, geospatial data, cartographic reference, pictorial items, databases, books, journals, federal documents, images, globes, bird's eye-view maps e.tc. (Vardakosta, 2022). In this context, the Map/GIS librarian's mission is to encourage appropriate use of the resources in order to expand existing knowledge (Traude, 1981).

Information Literacy in Map/GIS Libraries is not a new concept. As it is related with the user's needs there are a number of articles that refer to and research the users and their needs' best covering in Map/GIS Libraries (March, 2011; Sweettkind-Singer, 2001; Traude, 1981). Additionally, one of the goals of the ARL GIS Literacy programme in 1992 which initiated the GIS in the academic environment (addressed to map libraries and those that accepted to involve with this new emergent technology) was *"the development of a team of GIS professionals in the research library community willing to lend time and expertise to applications, user training, and education programs"* (French, 1999; Adler, 1995).

With the emergence of the internet and the ongoing evolution of GIS, networking, and knowledge management technologies, access to geographic data has now become a vital component of research and practice (Hanson, 2008, p.151). Interactive mapping tools make it simple to generate and distribute customized maps in academic and personal settings such as social media (Weesies & Dotson, 2013). Users require educational opportunities to develop adequate geographic information literacy to recognize and benefit fully from new geographic information media exposure (Miller, Keller and Yore, 2005).

Map/GIS librarians work continuously to develop service and formulate strategies that combine evolving technology and accommodate growing demand for geospatial materials, in order to suit the unique needs of students and researchers at their academic institutions (Scaramozzino e.a., 2014).

The purpose of this paper is to raise awareness amongst librarians in their involvement in user's education programs and in communicating their geo-collections. The paper examines concepts and definitions related to user education, explores how significant Map/GIS libraries approach information literacy and what

¹ <https://www.ala.org/tools/research/librariesmatter/category/social-role-library>

methods are used for this achievement to be accomplished. Furthermore, the paper underlines the role of the Map/GIS librarian and the necessary skills that he/she must have in order to successfully fulfil his educational duties.

2. Geo-information Literacy: Concepts and Definitions

Since 1974 that Paul Zurkowski in US was first used the term «Information Literacy» (Grafstein, 2007) a number of articles have been written to describe the concept and its strong position into the library operation (Torras and Saetre, 2009; Rader, 2002; Behrens, 1994). American Library Association (ALA) taking into account that in today's world there is a rapid technological progress and the information resources are growing in number and complexity, considers information literacy extremely important and explains (1989) that *“to be information literate, a person must be able to recognize when information is needed and have the ability to locate, evaluate and use effectively the needed information”*. Furthermore, ALA supports that the Information Literacy is the framework for lifelong learning and is relevant to all disciplines, learning settings, and educational levels (Welsh and Wright, 2010, p.1). American College and Research Libraries (ACRL) in the latest (2015) “Framework for Information Literacy for Higher Education” define Information Literacy *“as the set of integrated abilities encompassing the reflective discovery of information, the understanding of how information is produced and valued, and the use of information in creating new knowledge and participating ethically in communities of learning”*.

The Framework developed on a set of interrelated fundamental ideas with a diversity of application approaches. According those fundamental ideas an information literate individual possessing particular skill sets is able to: *“1. determine the extent of information needed, 2. Access the needed information efficiently and effectively, 3.evaluate the information and its sources critically, 4.incorporate selected information into one's knowledge base, 5. Use information effectively to accomplish a specific purpose, 6. Understand the economic, legal and social issues surrounding the use of information, and access and use information ethically and legally”* (Welsh and Wright, 2020, p.3; Behrens, 1994).



Fig.1: Conceptual Model for Data, Information, Knowledge, Wisdom -DIKW
(Welsh and Wright, 2010, p.2)

Similarly, Australian and New Zealand Information Literacy Framework (2004, p.5) states that Information literacy is a component of self-directed learning, which is itself a subset of lifelong learning (see Fig.2)

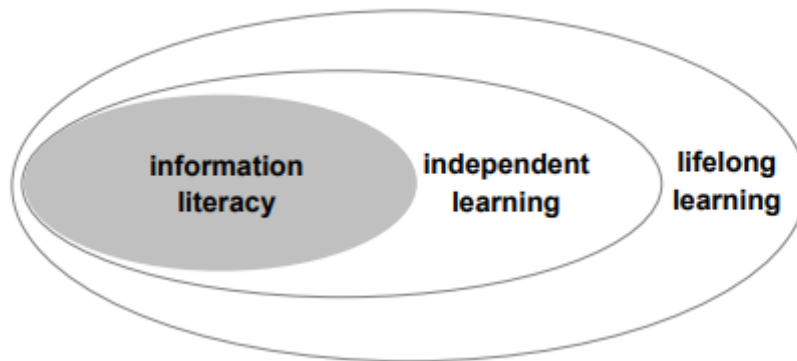


Fig.2: Information Literacy as a subset of Lifelong Learning
(Australian & New Zealand Information literacy Framework, 2004, p.5)

Miller, Keller and Yore (2005) in their article refer the definition that Krygier and Peoples (2003) suggest for Geographic Information Literacy inspired by the above general definition of information literacy that the ACRL proposes. According this, **Geographic Information literacy** is a special subset of Information Literacy. *Geographic Information Literacy shares some general and specific goals with Information Literacy (information search strategies, critical evaluation of sources) but also possesses some special challenges (searching for maps, and geographic data, evaluation of the 'accuracy' and characteristics of spatial data and representations)* (Krygier & Peoples, 2003, p. 19 in Miller Keller and Yore, 2005). They argue that geographic information literacy must include three areas: traditional geographic information literacy; digital geographic information literacy; and general information literacy (see Fig.3)

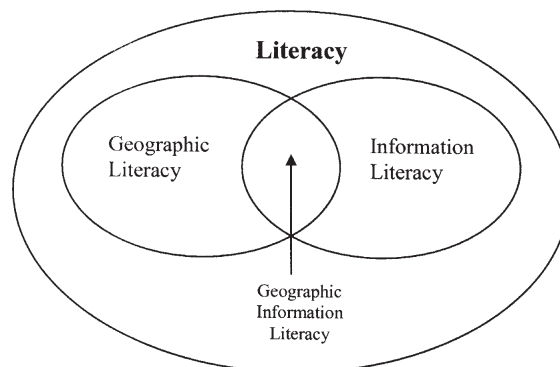


Fig.3: Contextual diagram for geographic information literacy (Miller, Keller and Yore, 2005)

Close to the above, Appel (2020) highlights that the **Geographic literacy**- a term that is also used by the Canadian Geographic Education (Moorman, 2019,p.10)- in the context of geospatial information literacy instruction invokes such topics as core geography concepts, primary source and map literacy, and spatial literacy. Someone who has the ability to seek, retrieve, use and transfer information usually from printed texts is considered as a basic information literacy individual. When this happens in the context of a geospatial information representation then, the person is considered as a geospatial literate individual (Moorman, 2019, p.9).

Appel (2020) wondering if the ACRL Framework can be used for defining geospatial information literacy puts forth the following definition: *“Geospatial information literacy instruction is informed by geographic literacies including geography, primary source, map, and spatial literacies as well as data and digital literacies such as data information literacy and the emerging cyber GIScience literacy”*.

National Geographic Society² introduces the term **“Geo-Literacy”**, *“for a long-standing idea consisting of three components: interactions, interconnections and implications. It is the ability to use geographic understanding and geographic reasoning to make far-reaching decisions. Whether we are making decisions about where to live or what precautions to take for natural hazards, we all make decisions that require geo-literacy throughout our lives”*.

According to Moorman (2019, p.10) the term **“Geospatial Literacy”** is more accepted in the academic environment than the term *“Geo-literacy”* due to the increased recognition of the importance of spatial thinking³ within the STEM disciplines (Science, Technology, Engineering, Art, Math).

On the other hand, Wade Aber & Wade Aber (2017, p.17) also emphasizing in the every day’s spatial thinking, use the term *“Geo-literacy”* to demonstrate that being geo-literate and having the ability to think geospatially is essential to effective decision-making.

For Slayton and Benner (2020) **spatial literacy skills** include the ability to: 1) effectively read and create maps including assessment of the source and use of the data presented, 2) collect and visualize data that is relevant and meaningful to the scale of human experience, and 3) identify the role of space and place in a story including the context and content of the story. Similarly, critical literacy skills include the ability to understand and question (1) a map makers’ choices, (2) the perspective of the storyteller, and (2) the need for a map in the first place.

As the ACRL Framework does not include resources related to geospatial education and the Geography discipline is not included on the lists of disciplines to be searched for content, Sadvari (2019) through his research results highlights the natural connection between ACRL Framework for Information Literacy for Higher Education and the *“Geographic Information Science and Technology (GIS&T) Body of Knowledge”*.^{4,5} As GIS&T represents the knowledge areas of the GIS&T, ACRL

² <https://www.nationalgeographic.org/media/what-is-geo-literacy/>

³ *“Spatial Thinking is the way that uses representations to help us remember, understand, reason and communicate, about the properties of and relationships between objects represented in space, whether or not those objects themselves are inherently spatial”* (National Research Council, 2006)

⁴ <http://gistbok.ucgis.org/>

⁵ https://www.ucgis.org/assets/docs/BoK/Topic_Overview_3_31_2022.pdf

Framework assists librarians in the incorporation of fundamental ideas when organizing instructional programmes in those fields.

3. Geoinformation Literacy and Map/GIS Libraries: Literature review

A variety of articles highlight the cartographic literacy in order students use maps as valuable material objects promoting the patron use of paper or digital map (Raynes & Heiser, 2020). The university map libraries with their cartographic corpora support educational courses and research activities and offer different facilities to academia for consulting digital maps through internal and publicly available databases, portals and platforms (Solar, 2016). At the University of Waterloo, Dodsworth (2007) argues that Map Librarian does not teach the users how to use the map to the same extent that GIS Librarian teaches about GIS data and technology.

In a survey Holstein (2015) conducted in 1997 in an effort to ascertain how ARL libraries that participated ARL GIS Literacy Project support patron GIS needs 78% of the libraries responded that “are able to provide more in-depth research project consultations”.

In Carnegie Mellon University despite the fact that library does not have a significant map collection or repository of spatial data they focused on training people to use GIS and building spatial literacy skills. This decision was motivated among other reasons for the academic library's unique position as a third place of learning outside of specific departments and studies at all levels across the university (Slayton & Benner, 2020). On college and university campuses, academic libraries represent prime locations for teaching GIS and geospatial concepts and skills. One of the reasons is that they are removed from the learner's home departments and represent an inclusive, intermediate space for learning fundamental concepts underlying more advanced data engagement (Gunderman, 2021). As Northwestern Libraries declare they “*are the main provider of GIS services and software at Northwestern University*”⁶.

In the Map Library at the University of Colorado Boulder use maps in the instruction lessons so to help students improve their spatial literacy. Maps as physical objects they are provide a different interactive experience to the student's everyday and object-based learning techniques are incorporated in the instruction sessions (Raynes & Heiser, 2019).

4. Methods of Geo-information Literacy implementation

Holstein (2015) suggests that a campus community requires training programs which usually vary among institutions. For instance some workshops offering students an introduction to mapping while others are focusing on specific features of a GIS

⁶ <https://www.library.northwestern.edu/libraries-collections/government-collection/>

program such as georeferencing or geocoding. Those workshops can be thematic and can be organized from basic to advance.

Geo-information literacy is a growing component in higher education (Dodsworth & Laliberte, 2015 p.173) and bibliography reveals a variety of methods, such as those that follows, that are used in the contemporary academic environment in order to geo-information literacy skills be provided. Some of the methods that Map/GIS Librarians and stakeholders initiated to provide geo-information literacy programs in their communities are as follows (see Fig.4):

- **Effective use of literature/Assignment Guidance**

Bauch and Sheldon (2014) introduce surf maps and concept ladders as potential assignments to guide beginning college students in producing original scholarship in their Cultural Geography course.

- **Incorporate it into the curriculum**

As for DeChambeau & Sasowski (2003) IL is so critical, it is useful to explicitly focus course features to include an IL function and to measure it as such. That's why they introduce a method for incorporating IL into the classroom experience by mapping an assignment to the ACRL standards.

At James Madison University the collaboration between Geography faculty and the liaison librarians facilitated successful integration of information literacy into the curriculum. Additionally, the librarians developed a computer based information Literacy test for Geography majors to identify that students were mastering information literacy skills (Kimsey & Cameron, 2005).

The West Virginia University (WVU) Libraries offered five grants through a program called Information Literacy Course Enhancement Program (ILCEP) to teaching faculty as to encourage the eventual campus-wide integration of information literacy across the curriculum. They assessed the success of the information literacy initiatives by conducting pre- and post-class questionnaires of the students that participated (Blake & Warner, 2011).

- **Classes**

Dodsworth & Laliberte (2015, p.175) highlight two personal experiences in teaching spatial literacy in the context of ACRL'S best practices: a) the "One-shot classes", and b) the "Full Semester Lecture Course". The goals of those courses were students to develop spatial literacy skills required to answer map/GIS related questions.

- **Lesson plans**

Gunderman (2020) designed and developed three lesson plans to be used for library workshops or within a course as an instructional session. These lessons, which are freely available, are based on three popular culture topics: *Dungeons & Dragons*, *Pokémon*, and 1980s music album covers.

- **Train the trainer**

Jablonski (2004) proposes a model for a lesson plan that provides educators with guidance on how to include information literacy skills into the GIS curriculum. It educates about how to educate a skill. Kong e.a. (2017) in Purdue University Libraries collaborating with multidisciplinary researchers used the ACRL Framework for Information Literacy for Higher Education to explore the library's role in supporting digital humanities in hosting a summer school for school teachers. In particular, using all the six frames of the Framework integrated spatial information literacy skills into the study of humanities topics such as civil rights and African American history and literature. The instructors were also the target group for Indiana University Libraries as they developed a three-day Primary Source Immersion Program to assist them to incorporate library sources (maps, photographs, diaries e.tc.) into existing or new courses (Quill e.a., 2019).

- **Workshops**

Zhang (2021) notices the increased interest of researchers, students and general public for the geospatial services and applications while there is an existing gap about GIS educational programs offered in Canadian academic and public libraries. Therefore at the Simon Fraser University library launched the "Web Mapping Workshops" series in 2020 applying the ACRL Framework, an initiative that as Zhang mentions has no previous implementation in web mapping.

- **Series of events**

Despite the fact that Carnegie Mellon Libraries does not have a significant map collection or repository of spatial data, they focus on training efforts to use geographic tools and building spatial literacy skills. They developed a Spatial Storytelling Series, a series of events over one year that taught people about spatial literacy and GIS through hearing the stories others had created and helping people create their own stories (Slayton & Benner, 2020).

- **GIS Day**

Academic Libraries that are engaged with GIS Collection & Services annually celebrate the GIS Day as an outreach strategy for engaging with their communities and strengthen the libraries' relationships with those groups involved in their educational programmes (Sadvari e.a., 2020).

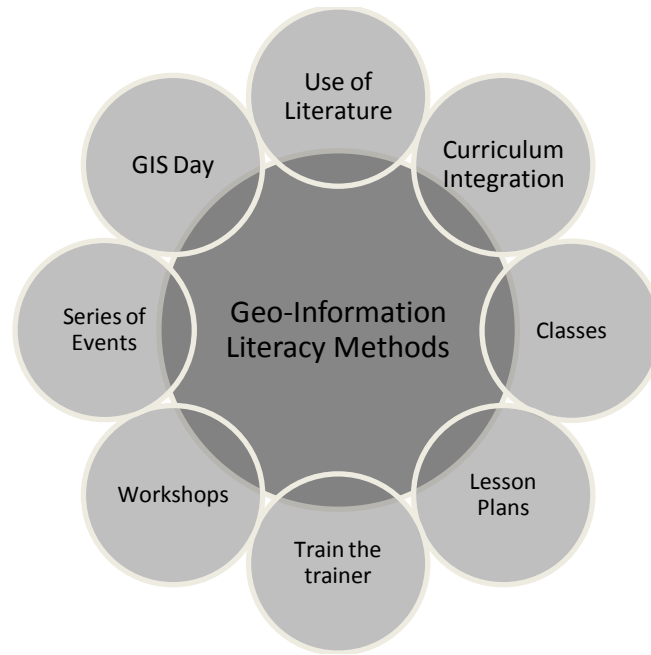


Fig.4: Some Geo-information Literacy Methods

5. Map/GIS Librarians skills

Map librarians are a tremendous help in assisting in cartographic research. They are an excellent source of information on the use of maps-both in the quantitative sense of what maps are being used by the public, and the qualitative sense of how the maps are being used and what problems or difficulties the users are having with their maps (Treude, 1981). A GIS librarian can interpret the data and map information of coordinates provided to patrons, explain the methods behind geospatial studies, and provide service and assistance for the analysis of the spatial data in their infrastructures (Aber, 2017, pp. 71). Cowen (2021) in his analysis for the evolution of GIS in academic libraries correlates the educational role that librarians should play with gaining new abilities in areas such as spatial analysis, spatial statistics, image processing and artificial intelligence. Dodsworth & Laliberte (2015 p.173) notice that only a few librarians have proper skills themselves.

The MAGERT Education Committee (Weimer, Andrew & Hughes, 2008) filling the gap of the absence of an authoritative resource detailing the skills required for Map/GIS Librarians outlined the core competencies in the map librarianship profession⁷ that previously did not exist. Among other skills, the committee identifies in the “Map Librarianship” section that the Map Librarian should be able to work for the “*Development of formalized curricula for use in an extended classroom situation or workshop [Level 3]*”. As for Map Librarians there are not any other similar skills on the section for the “Core Competencies for GIS Librarianship” the committee propose under the topic II.A.2. “Marketing and Outreach” (p.11), the

⁷https://alair.ala.org/bitstream/handle/11213/13554/MAGIRT_ElectronicPublications07_MapGISAndCatalogingMetadataLibrarianCoreCompetencies_MAGERTEducationCommittee_2008.pdf?sequence=1&isAllowed=y

“Communications and Event Planning Skills”. The skills that the committee relates to the topic “II. C. Information Services” includes “Reference” (II.C.1, p.13), “Instruction” (II.C.2, p.14) and “Research Consultation” (II.C.3, p.14).

6. Conclusions

Map/GIS libraries should play an educational role in their communities as they are the main open, democratic spaces and connection points to help people while sustain a wide range of infrastructure and collections. Yet, geo-information literacy is an issue that raises questions and discussions for many in the field mostly for the role that Map/GIS Librarianship should play (Benner & Slayton, 2020; Piekielek & Bidney, 2020).

This work ascertained a variety of methods that Map/GIS Librarians utilized in order to achieve their educational purposes and contribute to the maximum use of geographical resources. Even though the methods that were presented in their majority originated from universities with significant collections, the decision of a university to deal with geo-information literacy in favour of their patrons’ spatial skills indicates their strategic orientation for the future. This future has two main characteristics in which have shown interest not only academics (students and faculty) involved with geosciences but also other communities: the constant change in technologies and the enormous amount of geodata that are published every day. Co-operations in developing geo-information literacy programs along with the continuously advance of librarians’ skills should be further researched. Map/GIS Librarians ought to deal with the educational aspect of their profession in order to promote their collections and develop the geo-information skills of their patrons.

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