

## Geospatial Literacy as Digital Literacy: Building GIS Program to Support and Engage with Interdisciplinary and Multidisciplinary Research Communities

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### Abstract:

*What is geospatial literacy and how is a form of digital literacy? This paper addresses the importance and the need for geospatial literacy across the community, particularly the research one. Digital literacy is the ability to discover, interpret, synthesize, create, evaluate and use digital information such as texts, images, video, sound, interactive web pages and other multimedia formats collectively and effectively. Geospatial or spatial literacy is one kind of digital literacy that is becoming highly important for anyone who wishes code or decode visuals and identify key elements in a visual or digital media. The paper explores how creating geographic information system (GIS) program that emphasizes geospatial literacy can teach 21<sup>st</sup> century digital literacy skills through visual and data analyses; empower users to access and create resources in digital mapping tools; and how a GIS program can foster and build a community of researchers and activities as demonstrated in two case studies: NYPL's Map Warper and Harvard's WorldMap pages.*

**Keywords:** geographic information system, digital literacy, information literacy, geospatial literacy, and urban studies

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### Introduction

Today academic and public libraries are supporting more and more patrons on using various geospatial programs: from collecting maps to demonstrating the use Google Earth or other variety of geographic information system (GIS) tools. It is important to note that the study of geography is not just about maps, locations and place names but the integration and analyses of the relationships, connections or patterns between people, locations and environments through visual and digital forms. GIS research is becoming highly pertinent in every field or

issue concerning society. The library's role and responsibility lies on preserving these mapping and data resources and teaching patrons on how to access them. There is a growing demand for libraries to identify readily available GIS tools and resources including map data; and to provide support in spatial analysis and consultations in historical maps or georeference, a process of associating maps with a spatial location. Beyond the disciplines of history, geography and cartography, GIS research is actually all encompassing and requires an understanding in interdisciplinary and multidisciplinary approach to research.

This paper explores how creating a library's GIS program can teach 21<sup>st</sup> century digital literacy skills through visual and data analyses. Geospatial literacy can be developed from a GIS program, which can foster, empower and build a community of researchers, activists and thinkers alike to come together to support and work on a common cause. Examples of GIS projects that utilize crowdsourcing methods will be explored: NYPL's Map Warper and Harvard's WorldMap utilizes GIS components to teach digital literacy. For librarians to stay updated with emerging technologies and digital literacy, they must also develop geospatial literacy in order to provide support to and engagement with the greater community.

### **Geospatial Literacy as Digital Literacy**

How is geospatial literacy a form of digital literacy? In this context, "digital literacy skills address the fact that information is no longer limited to text but also includes still images, video, sound, interactive web pages."<sup>1</sup> Geospatial literacy can be understood as a process to visualize, understand, organize, map, synthesize, interpret and make sense and use of data, visual and geographic information. It is a kind of literacy that is very much needed in today's world. Geospatial literacy can allow users to comprehend, contextualize or visualize the world or local issues, challenges, gaps or problems through multi-layer dimensions in relations to space, geography, time, location and people. Geospatial literacy can also help users "better understand their spatial and temporal place in the global picture."<sup>2</sup>

We find that geospatial literacy can be developed by anyone: high school students, undergraduates, graduates, faculty, librarians, politicians, businesspeople, entrepreneurs, law enforcers, and other groups may all need to have basic concepts of geospatial literacy today. Geographic information system is a system of computer software, hardware, data or technologies that can manipulate, analyse and present information in relations to a spatial or geographic information. Current examples of GIS tools include Google Earth and Google Maps. These applications can be used in any kind of setting: from emergency services in a major city to political outreach, GIS tools can analyse spatial data for all kinds of purposes by providing, enhancing presenting graphic features while strengthening geospatial literacy.

The practices of geospatial literacy may also include other areas beyond comprehending maps and visual and digital mediums. They may include creating spatial join that uses and affixes data from one feature and applying another; or finding historical maps, local or global data or shapefile, a geospatial data format. By exploring data using GIS tools, the data can become information and later that information can transform into knowledge. These skills may be advanced to some people but they are part of the process of developing geospatial literacy.

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<sup>1</sup> See Leo Tan Wee Hin, and R. Subramaniam. (2006) *Handbook of research on literacy in technology at the k-12 level*. P. 290.

<sup>2</sup> Laura Guertin et al. (2012) Enhancing geographic and digital literacy with a student-generated course in Google Earth. *Journal of College Science Teaching*. 42 (2). P. 33.

## Best Practices of Building Community Engagement

There are many examples of community engagement through GIS projects. First, the library should focus on the library as the place for creating knowledge. It has always been assumed that the library has been the place that stores information and provides access to content and information. However, today we see that the library can be the centre of creating and disseminating information appropriately. Libraries are also “data distributors through the management of data repositories.”<sup>3</sup> Libraries can digitize and share their mapping resources to a wider audience online and encouraging and engaging users to analyse and utilize these maps for all kinds of purposes: emergency responses and routes when disasters strike; the spread of viral diseases such as ebola in cities across the world; or citizens of a war-torn nation such as Syria become migrants and travel from one asylum to the next. These real-life examples can be traced and mapped out through GIS resources. More importantly, the library can provide and facilitate these resources and “open” them up to users to utilize for their research studies.

The second aspect that is important is to share and promote library’s GIS services, collections and resources widely. Being the creator of mapping resources may not be enough. The library needs to become an active partner and collaborate with other agencies to share these collections appropriately. One of the challenges to support geospatial literacy is the technological component. Not all users have access to computer technologies, the Internet and online resources or have the skills to navigate the digital world. The library needs to develop and promote services that rely on a variety of formats: prints, digital and data-related resources. Through a series of workshops or programs, the library can continue to frame the concept “digital literacy” as a matter of a global citizen’s skill where everyone should know and have access to digital literacy skills through the library so that they will not be left behind in society. By promoting workshops and services to the community, people will have access to these tools, information and support from the library.

Third, geospatial literacy does not fit into or support only one kind of discipline. As described in the earlier examples, GIS research is all encompassing and integrative: foster interdisciplinary and multidisciplinary approaches and fields in the humanities, social, physical, and biological sciences. Librarian Benjamin Branch (2014) writes that, “Academic libraries should recognize and promote spatial literacy as an important skill of a global citizenry because governments around the world use spatial data.”<sup>4</sup> To start research conversations about the topics of GIS, the library could identify appropriate academic programs or community groups and potentially promote workshops or public programs featuring scholars or community activists who use GIS research that cuts across the disciplinary borders.

Every year there is also a global educational event held in November called “GIS Day” presented and supported by the Environmental Systems Research Institute (ESRI) that celebrates GIS. ESRI is a major company that produces geographic information systems, tools and geo-databases. Schools, universities, businesses and public libraries worldwide can organize and have organized GIS Day in their institutions. This program can promote and

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<sup>3</sup> Rory Elliot. (2014) Geographic information systems (GIS) and libraries: concepts, services and resources. *Library Hi Tech News*. 31 (8). P. 10.

<sup>4</sup> Benjamin Branch. (2014) Libraries and spatial literacy: toward next –generation education. *College and Undergraduate Libraries*. 21 (1). 111.

present different mapping projects, tools and resources coming from users or ESRI. This kind of event is an effective outreach promotion to bridge the GIS experts and the general public or novice. The opportunity to promote geospatial literacy during the event is critical and advantageous. The event can inspire attendees to create their own GIS project but to better understand the important role of geospatial literacy in today's world.

The library can demonstrate how to use geospatial technologies and how to find historical collections in the library or online. The library will also need to hire specialists or train library staff on how to use these tools and find geospatial data. There are plenty of articles and resources to help build GIS services in the library. Consider reading Martindale's article (2004) on the challenges and opportunities to help entry level GIS librarians begin this career. The process can be difficult but rewarding. Users of the library are not simply consumers of information; they are also producers along side with the library. The library can also collaborate with users in numerous ways, as this paper will demonstrate in the next section. Through crowdsourcing, rectifying maps, visualizing data and finding and managing geospatial data, the library will need to provide specialized research and digital services to offer geospatial literacy to the public.

## Case Examples of Geospatial Literacy Programs: NYPL and Harvard

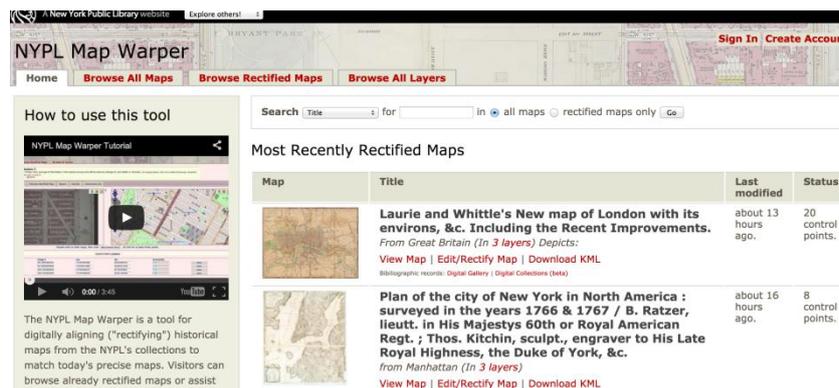


Figure 1. NYPL Map Warper <<http://maps.nypl.org/warper/>>

There are many online mapping programs that are open access and free the public. They can build on the teaching of geospatial literacy. In this section, I will explore two case studies that can help users understand and develop geospatial literacy via online.

The New York Public Library's (NYPL) Map Warper is a powerful open access mapping tool that permits users to access, find and rectify digital maps. According to the website, the Map Warper is a "tool for digitally aligning (rectifying) historical maps from NYPL's collections to match today's precise maps."<sup>5</sup> Since 1898, the library has collected over 40,000 map sheets from all over the world such as U.S, Europe and Asia. This rich collection can be useful for researchers interested in interdisciplinary and multidisciplinary fields: history, geography, urban studies, cartography, library science, and politics.

The purpose of this online program is to engage with users online by having them align or rectify a map from its digital repository. Users can find an old map in the collection and then they can place the map in the current boundaries via Google Maps and explore new changes

<sup>5</sup> See NYPL Map Warper <<http://maps.nypl.org/warper/>>

in geography and space. This overlapping of maps can create a “rectified” map that can be stored in the library’s digital repository. Thus, a crowdsourcing method where groups of users are actively engaged and contributing content or services to library for free and forming an “online community” in another aspect.

In one example, we can use a rectified map sheet of Manhattan, New York from 1857 and identify the changes in the names of the streets or locations of old buildings. This process of identifying visual elements in a digital media can enhance geospatial literacy. When a map is “rectified,” new knowledge can be formed as well. Users learn how to visually interpret maps, and identify boundaries and details in a map such as legends are all important aspects of geospatial literacy. Participants learn how to read maps and discover the impact and changes in society through these maps. They think differently about history and ask questions about the past based on these images. They are empowered as well since they have access to this resource online for free and can add and contribute to a greater cause all online. This program is simple to use and does not require a lot of data research or analysis to get started. It is a practical approach for people to learn history while developing geospatial literacy skills.

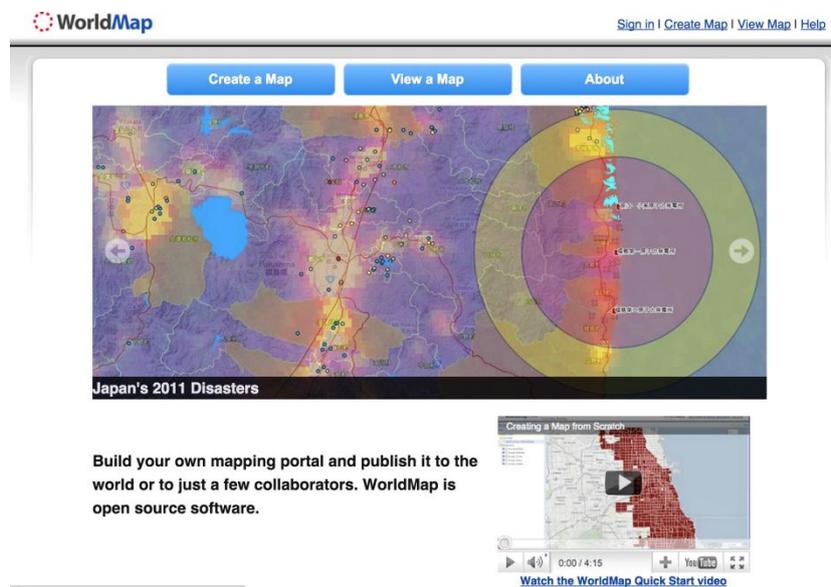


Figure 2. WorldMap, Harvard <[worldmap.harvard.edu](http://worldmap.harvard.edu)>

The WorldMap platform from Harvard is different from NYPL’s Map Warper site. It is an open source software that “attempts to fill a growing niche between powerful desktop-bound mapping applications and lightweight web map solutions with limited capacity.”<sup>6</sup> Launched in 2011, this collaborative project allows users to upload or export large datasets, create and edit maps, and make use of online cartographic tools. More broadly, the site teaches users how to think about mapping projects critically and analytically by opening up its’ digital maps for free and permitting users to actively create, build, rectify and assess its content. Users can find teaching resources available in the site for anyone interested in using this pedagogical tool. For anyone who is not an expert in GIS, they may find this resource to be quite simple to use. First, users can register for a free account to access the site. There are options of different mapping sources such as Google Roadmap, OpenStreetMap that users can start with. From

<sup>6</sup> See WorldMap, Harvard <<http://worldmap.harvard.edu>>

there, users can search and add layers that are available in WorldMap, upload layers from one's own server or from other remote servers from the other world. With this feature, users can combine different data sets and layers in the free map view. These files can be saved into the account. Users can add information, keywords or abstract or descriptions of the digital map they just created. WorldMap can also be collaborated with many users in the online community and promote geospatial literacy through digital mapping tools. Users can identify data sets, visual elements and mapping codes in this open source software. The tool also empowers users online by providing these resources for free. One opportunity is that the library can teach patrons on how to use this tool or collaborate with agencies, schools and college courses to design GIS projects when using this site. With these projects being available online, the possibilities to develop geospatial literacy are there but they may require time and patience to understand how to effectively utilize these tools first.

## **Conclusion**

Geospatial literacy is an essential skill for anyone to understand how to assess, synthesize, create and interpret digital and visual mediums. Today we live in a world where maps can play an important role to show how geographies and boundaries can change and have changed and how people, places and environments are interconnected in society. As more and more people have access to digital mapping tools such as NYPL's and Harvard's, geospatial data and information, they may also need help interpreting or utilizing these resources effectively.

The library can build these services and programs: introduce and reinforce the concept of geospatial literacy and provide access to these resources for those who do not have access to the virtual web. Libraries will need to hire specialists and train library staff on how to use these GIS tools and resources. It will be a major challenge but it is important that the library continues to play a role in providing, disseminating and creating information to the public in the 21<sup>st</sup> century. Through GIS program, the library can create collaborations and empower communities to develop and build geospatial literacy so no one is left behind.

## **References**

- Bayram, S. and Ibrahim, R. (2005) Digital map literacy bounded with culture under geographical information systems perspective. *Journal of Visual Literacy*. 25 (2). P. 167-176.
- Branch, B. (2014) Libraries and spatial literacy: toward next –generation education. *College and Undergraduate Libraries*. 21 (1). 109-114.
- Elliot, R. (2014) Geographic information systems (GIS) and libraries: concepts, services and resources. *Library Hi Tech News*. 31 (8). P. 8-11.
- Guertin, Laura, et al. (2012) Enhancing geographic and digital literacy with a student-generated course in Google Earth. *Journal of College Science Teaching*. 42 (2). P. 32-37.
- Jablonski, J. (2004) Information literacy for GIS curricula: an instructional model for faculty. *Journal of Map and Geography Libraries*. 1 (1). P. 41-58.
- Martindale, J. (2004) Geographic information systems librarianship: suggestions for entry level academic professionals. *Journal of Academic Librarianship*. 30 (1). p. 67-72.

NYPL Map Warper, accessed 10, May, 2015 < <http://maps.nypl.org/warper/>>

Tan, L. and R. Subramaniam. (2006). *Handbook of research on literacy in technology at the k-12 level*. Hershey, PA: Idea Group Reference.

World Map, Harvard, accessed 10, May 2015 < <http://worldmap.harvard.edu/>>