

The Role of Libraries in Geography and GIS Education: Conversations to Community

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Abstract

This paper describes the Role of Libraries in Geography and GIS Education project, a study funded by the National Center for Research in Geography Education's Research Coordination Network grant. The grant allowed us to formalize the project, fund events, foster conversation, and promote the project. Our research highlights libraries as uniquely situated to support and reinforce geography and GIS education received in the classroom due to an ongoing commitment to hiring a variety of map and GIS educators and curating a wide range of geospatial data collections.

Keywords: libraries, spatial literacy, library educator, geography and GIS education

Introduction

In the last few decades, geography education in the US has seen a marked shift. According to a recent article by geographer David Kaplan, geography programs are currently the smallest liberal arts discipline in the United States, existing in only 1 in 8 colleges and universities. They are even less likely in private institutions (3%) than public institutions (41%) which still only amount to less than half of all higher ed (Kaplan 2020). American youth are increasingly geographically illiterate which leaves many college students underprepared for identifying geographic connections across the curricula they are immersed in on campus but also generally unprepared for life (Bednarz et al. 2013). The development of GIS technologies and the 'spatial turn' in various humanities, which identify geospatial technologies as new horizons for interdisciplinary practice, has produced a desperate need for geographic and geospatial education on campuses. In some cases, new specialized and interdisciplinary programs are being created, in others, environmental studies, global studies or sustainability majors are taking cognate classes in geography (when available) (Kaplan 2020). While geography programs in higher education are adapting, and in some cases, expanding (Murphy 2007), campuses with no geography department or no clear destination for this training need help supporting these students.

There is a place on campus that has been fostering varying levels of geospatial - and to some extent - geographic education for more than 30 years: *academic libraries*. Both academic and public libraries have long engaged in workshops focused on general mapping knowledge, tool training, and spatial literacy. These institutions have also offered free access to GIS software and data. Libraries are uniquely situated to act as a hub for teaching spatial literacy and critical engagement with geographic concepts because these institutions serve a wide swath of the population. This includes students from a multitude of disciplines or departments within a university, researchers at various stages in their projects, and the broader community served by public libraries including bustling civic-tech communities in cities nationwide.

We believe that libraries are vital nodes in any educational network. Contributing more than documents or other materials, libraries and the people who work in them have a core mission to increase all forms of literacy including spatial literacy. In 2019, we began a project to understand the roles libraries play in spatial literacy, teaching, and supporting map and GIS consultations. This paper describes our Role of Libraries in Geography and GIS Education (ROLGGE) project, a study funded by the National Center for Research in Geography Education's (NCRGE) Research Coordination Network grant. The grant allowed us to formalize the project, fund events, foster conversation, and promote the project. Our work explores the role of university libraries in supporting various facets of geography education and makes recommendations for pedagogy on broader geographic concepts to promote and enable critical engagement with spatial tools and datasets both in and outside of geography departments. Libraries provide spaces in which students, researchers and others can explore spatial tools and datasets with a critical eye alongside dedicated specialists whose role is to help them.

Academic libraries include a wide variety of instructors but are underutilized as partners in education

At their core, all libraries are cultural heritage institutions that support education, research, and civic life within a community. Libraries are important for communities because they provide one of the only remaining public spaces for people to congregate and access information. There are many kinds of libraries - public libraries, school libraries, corporate libraries, and so on. Our context is the academic library within a university, but we understand the need for a network of libraries to truly support geography and GIS education within a city, state, and even the country. We feel that our work exploring connections among academic professionals will also benefit those seeking to develop materials for other audiences.

Academic libraries are charged with supporting the entire campus regardless of disciplinary focus, positioning libraries as a key stakeholder in the

educational activities for the majority of campus stakeholders. Many academic and public libraries are repositories for maps and spatial data sets via the Federal Depository Library Program. As deposits became increasingly digital and spatial data were deposited alongside paper maps, these libraries became stewards of this digital content and its accompanying tools. Thus, libraries have been supporting stand-alone GIS tools since the 1990's by making the tool available for in-library use and in more recent years, providing training to users with personal versions of the software on their own devices. Today, libraries continue to provide large volumes of spatial data and have recently helped create improved repositories for storing and serving data to users (Reed 2015).

Today, the growing ubiquity of both proprietary and open-source tools for making maps and conducting spatial analysis put these tools easily in the hands of anyone with access to a computer and the Internet. Thus, the charge of libraries to facilitate the literate use of these tools and a firm socio-contextual view of spatial datasets is paramount. Library educators are continuing to develop workshops to support a growing list of spatial tools that are both stand-alone installations like QGIS and ArcGIS Pro and web-enabled or modular components to larger web applications like CartoDB, GeoPy or ArcGIS Online (McGinn and Duever 2017). Recently, as more disciplinary experts from the digital humanities, anthropology, geography, engineering, and others are working in libraries, they are progressively teaching more about core geographic concepts, histories of cartography, and/or using diversity, equity and inclusion-oriented and critical pedagogies.

We feel that encouraging faculty and students to partner with academic libraries can lead to transformative educational experiences. Library educators can support the development of pedagogy, research in geography education, and teach people of all ages about geographic practices, maps, data, and spatial information. More importantly, libraries can be seen as a place with people willing and able to teach. Our role is to not only support the information infrastructure: we are teachers and the opportunity to partner with educators across campus routinely leads to better learning practices and outcomes.

Kimsey and Cameron (2005) writing in the *Journal of Geography* by the National Council for Geographic Education provide a good example of collaboration between geography faculty and an academic librarian on a course indicating that most partnerships center on supporting a research assignment in the course. The authors assert that (Kimsey and Cameron 2005, p 18),

While students today may not have to enter a library to conduct research, they still need systematic instruction in finding what they need. This requires the librarian and the geographer to work together to create an appropriate information literacy curriculum.

Despite this connection between libraries and education, there seems to be a lack of awareness of these opportunities within the geography education community. In the last 10 years of the *Journal of Geography* there are no articles involving collaborations with academic or other libraries. A quick search through the recent book *Geography Education in the Digital World* (Walshe and Healy 2020) includes no discussion of libraries as part of the landscape of digital geography education. Libraries are missing from these conversations and often from the classroom.

We believe libraries act as a stronghold for education on spatial literacy and critical engagement with geographic concepts in the following ways:

1. Libraries are connection points to help people (community members and students) learn about spatial concepts and geospatial tools.
2. People encounter geospatial tools in their daily life on a wide scale but they are often unprepared to engage with or use these technologies in critical ways. Library educators help to place these technologies in historical and disciplinary contexts.
3. Libraries are spaces that can be used to:
 1. Teach about spatial concepts (one-off, series or full courses).
 2. Consult with and support individuals in their existing and emerging projects.
 3. Outreach to a variety of communities about geography concepts and the role of geography in society.

The RoadMap for 21st Century Geography Education project proposed several recommendations for the geography education community, including building partnerships with formal and informal educators (Bednarz et al. 2013). We encourage all geography educators or any educator to take better advantage of the libraries in your communities and campuses.

From Informal Conversations to a Growing Community of Practice

To support our own teaching in the University Libraries at Carnegie Mellon University, we thought it would be a good idea to bring together librarians from multiple types of institutions to discuss what the needs of students and faculty are in relation to learning both tools and theoretical concepts related to geography, GIS and spatial data. Through funding for network building from NCRGE, we were able to support several initiatives to bring people together in conversation and ultimately grow a community of practice. Our original aim was to have conversations on three 'levels'. A hyper-local conversation that included different types of educators across the city of Pittsburgh, a state-level conversation that included people working in libraries or teaching geography across the state of Pennsylvania, and a national-level conversation that included geographers and people working in libraries across the US. At the end of the project, we would

collate the findings from each of these conversations and have a network of contacts to continue the conversations into the future. The next section describes these conversations.

Initial Conversations

In the Fall of 2019, we held the first conversation, the hyper-local conversation, at our library on Carnegie Mellon University campus. Participants included librarians from Carnegie Mellon University and the University of Pittsburgh, a principal and two librarians from local high schools, the director of a local data center and a GIS Specialist from Allegheny County. This conversation also included two regional participants, a librarian from Penn State and one from Ohio State. These conversations provided insight into the hyper-local network of informal geo-educators across the city. Many in attendance are teaching workshops for various audiences and some teaching semester long courses. We learned that for many participants, teaching in an informal setting means that there is both flexibility in creating the content outside of the curriculum and freedom to tailor the content to directly support formal teaching contexts. On the other hand, one major drawback to teaching in informal settings outside the classroom is a lack of formal feedback mechanisms (i.e., evaluations).

The state-level conversation was planned to be a day-long symposium in May of 2020 during the annual PA GIS Conference. We were planning with colleagues at Penn State University Libraries, when the COVID-19 Pandemic hit. With the pandemic, this event was canceled, and we have not convened this conversation as of the time of this writing. The national-level conversation occurred during two sessions at the Annual Meeting of the American Association of Geographers (AAG) in early 2020. The session included presentations from geo-educators in several libraries across the US, geographers in the US and Spain, and one educator working in industry. Presenters discussed a variety of projects including a tutorial on finding historical aerial photographs, teaching GIS in the library using Jupyter Notebooks, results of research to create a cross reference between information literacy and geographic concepts, library-oriented research into mapping settlers in Poland, and a collaboration between a geography professor and their campus library. These sessions showed us the wide range of roles that libraries are playing in geography and GIS education from building passive, on-demand tutorials to generating shared teaching resources like a Jupyter notebook to conducting foundational research on a community of settlers or the basics of information literacy and geography. These sessions and the conference were held via Zoom due to the continued effects of the pandemic.

After the success of the AAG sessions and the benefits realized of being able to gather across states in the same “room”, we continued the conversation in 2020 with two series of virtual meetings, once per week for four weeks during the months of April and September. These conversations included some geographers

and a few students but were mostly library professionals. Conversations continued to expand on themes set during the initial conversation in Fall 2019 including library pedagogies, teaching technology, and teaching in informal settings. Each conversation included guiding questions that were used to generate discussions with space left open for the ideas to evolve and participants to ask their own questions. Community generated topics related to consultations, the diverse disciplinary backgrounds of library geo-educators, professional development, and collection development. For a full discussion of these and the previously mentioned conversations, see Slayton and Benner (2020a).

After these conversations, we realized that the educational role of libraries was stronger and more diverse than we initially thought at the outset of the project. Most of the participants in our conversations agreed that the need for spatial literacy and mapping support is growing. Students and researchers from across all disciplines are using spatial information or wanting to learn more about how spatial data or maps can inform their work. Instruction (aka workshops, class presentations, and guest lectures) is a key component of educational support from libraries yet we learned from the conversations that there are no set rules for teaching with GIS and maps in informal settings. Work is being done to better align information literacy concepts and instruction practices with the GIS&T Body of Knowledge (Sadvari 2019), but currently there is no codified practice.

Building and Sustaining a Community of Practice

These conclusions indicated that there was a need for an ongoing conversation about these topics. Our opinions on this need were reflected back to us at the final meeting of our initial conversations. When we discussed the future, people wanted to continue to build this community, as it had benefited their work and ability to gain insight from library professionals in different contexts. In response to this need, we created a monthly meeting, a conversation space (<https://groups.io/g/geolibraries>) and a commitment to build an ongoing community of practice. We have since invited our members to offer their own topics of discussion, as well as, invited speakers for one off presentations. This has led to a series of new topics such as spatial data management and storage for broader access, how to outreach to the communities both in and outside of the university, hosting ‘fun’ events for GIS day, and many more. We have also experimented with different types of sessions, including break out rooms and a round robin style of updating. The variety of topics and sessions keep the meetings interesting and keep us from getting stuck on specific pre-set topics.

Some of our most well attended sessions included guest speakers on geotadata and spatial literacy. The geotadata presentation focused on the challenges related to describing maps and spatial data and some of the history of developing a geotadata schema. Being able to bring in a group of people working at the center of these issues and providing a space for colleagues to ask

questions is at the heart of our purpose with ROLGGE. Similarly, we hosted a panel of speakers on spatial literacy. We invited geographers and others who had written about spatial literacy to provide their definition of spatial literacy and then opened the floor for discussion. This session helped uncover differing views on what it means to fully understand concepts of space and place, as well as, how to best instruct on these spatial literacies. This conversation delved into tool specific vs agnostic approaches, the importance of learning basic GIS principles, and what geography concepts are best to start with when engaging in shorter learning workshops typical of library instructions. The variety of topics suggested by these experts shows that we still have much more to discuss and learn from each other.

In addition to inviting speakers to offer guest lectures on their work and expertise, each session starts and ends with asking for general updates from the field. Meaning that when we begin our work together each month, we are being informed of various updates to practice, newly minted pedagogy or events, as well as any publications or news of new concepts introduced to the field. Sharing these updates helps us not only stay current with existing practice but has also been known to spark discussion on specific activities or theories being worked on at multiple institutions. This is the main opportunity for us to see how we as a community of practice are both developing and working towards the same goals.

Another part of the community of practice is a shared repository of teaching materials. ROLGGE members needed a space to share their pedagogical materials as well, to not only consolidate thought around spatial literacy instruction but also to support the development of burgeoning Library GIS programs. Instruction Materials by and for GIS Librarians and Practitioners (IMGIS) is an OSF page (<https://osf.io/zfv4e/>) where any member of the community can make their pedagogical materials and associated data publicly available and searchable. IMGIS was developed by Lena Denis, Jennie Murack, Emma Slayton and Amanda Tickner, in a joint effort between the ROLGGE and IASIST Geospatial community. As such, our hope is that it will expand to collect materials from multiple sources and inspire the creation of common definitions and goals in the realm of GIS and geography library short form instruction. As ROLGGE continues to grow, we hope that we can add to this list of education offerings, as well as community engagement and outreach practices mentioned above.

As we were finishing the project, we wanted to gather examples of the pedagogical research and practices happening within the community of practice and share them as a publication. We solicited papers from the community of practice at large for a special issue of *Journal of Map and Geography Libraries* (Benner and Slayton 2020). We chose this journal to house the special issue due to its previous issues on similar topics and its wide reach to library colleagues, with the emphasis on targeting potential new members for ROLGGE. Articles in this special issue focused on using spatial storytelling in the classroom (Slayton

and Benner 2020b), tool specific training for GIS engagement (Zhang 2020), the confluence of digital humanities and geospatial education (Duever and McGinn 2020; Gunderman 2020), and engaging the broader community in GIS and spatial literacies (Sadvari et al. 2020; LeBlanc and Lipton 2020).

There are many existing communities that support GIS, map, geography, and geoscience librarianship including groups like the American Library Association's Map and Geospatial Information Roundtable, the Geoscience Information Society, University Consortium for Geographic Information Science, and smaller, more familiar groups like the Western Association of Map Libraries, or Geo4Lib Camp (an annual event for discussing geo-repositories and collections of digital data). Tailored conference sessions and special interest groups like the Geospatial Interest Group of the International Association for Social Science Information Service and Technology (IASIST) are also regularly occurring. These are important venues for library professionals working with maps and spatial data to build community and share their ongoing work formally. We decided to curate a more informal venue on a more regular basis to achieve similar aims. Much of our conversations were focused on teaching in libraries and what the work of a library professional teaching people about maps, GIS, and spatial data looks like. We hope the community of practice has and continues to be a space to make connections, learn from each other and a space to get new ideas and have fun.

Conclusion

We have reported on our activities to build a community of practice of library professionals and others focused on the role of libraries in geography and GIS education. Funding from NCRGE provided us with the resources to host a series of conversations, travel to conferences and make connections, and maintain a forum for ongoing conversation. Though led from the library perspective, we feel this group has advanced cooperation within the library community and between libraries and others to better support the interests of students and faculty engaging with spatial tools and data. We hope educators in geography, and other disciplines, reading this will consider the role that libraries and educators working in libraries can play in their classroom.

This endeavor has grown beyond our original notion to host a series of conversations to include publications, special events that build guidance for general practice, and a repository of existing pedagogical materials used to teach spatial concepts in libraries. We hope that through the coming years, ROLGGE will serve as a point of connection and starting point for future grants, programs, and projects that further the collaborations between libraries and faculty, and students in a variety of disciplinary settings across multiple institutions. The program outlined in this work demonstrates that ROLGGE serves as a networking opportunity to library professionals who may have previously found it difficult to meet with others outside their institution due to funding and the requirements of

library work. Filling a unique need expressed not only by our own community, but by broader networks of GIS and geography education. We will continue to serve as a platform for GIS and map library educators to describe our work to non-librarians in the fields of geography and GIS implementation and most of all be an informal space to converse and share ideas.

Links in the text

Geolibraries.groups.io, <https://groups.io/g/geolibraries>
Instruction Materials by and for GIS Librarians and Practitioners (IMGIS),
<https://osf.io/zfv4e/>

References

- Bednarz, S. W., Heffron, S., & Huynh, N. T. (Eds). (2013). *A road map for 21st century geography education: Geography education research (A report from the Geography Education Research Committee of the Road Map for 21st Century Geography Education Project)*. Washington, DC: American Association of Geographers.
- Benner, J., & Slayton, E. (2020). Supporting geography and GIS education in libraries now and into the future. *Journal of Map & Geography Libraries*, 16(3), 225–228.
<https://doi.org/10.1080/15420353.2021.1965404>
- Duever, M., & McGinn, E. (2020). Teaching GIS in a digital humanities environment. *Journal of Map & Geography Libraries*, 16(3), 229–238.
<https://doi.org/10.1080/15420353.2021.1944951>
- Gunderman, H. C. (2020). Developing lesson plans for teaching spatial data management in academic libraries through a lens of popular culture. *Journal of Map & Geography Libraries*, 16(3), 239–253.
<https://doi.org/10.1080/15420353.2021.1944948>
- Kaplan, D.H. 2021. Geography's position in education today. *The Professional Geographer*, 73(4), 608-618
- Kimsey, M. B., & Cameron, S. L. (2005). Teaching and assessing information literacy in a geography program. *Journal of Geography*, 104(1), 17–23.
- LeBlanc, M., & Lipton, B. (2020). Beyond the map: Engaging audiences with GIS at the Leventhal Map & Education Center. *Journal of Map & Geography Libraries*, 16(3), 254–263.
<https://doi.org/10.1080/15420353.2021.1944949>
- McGinn, E., & Duever, M. (2017). We mapped it so you don't have to: Comparing online data mapping platforms. *College & Research Libraries News*, 78(9). <https://doi.org/10.5860/crln.78.9.486>
- Murphy, A. (2007). Geography's place in higher education in the United States. *Journal of Geography in Higher Education*, 31, 121–141.
<https://doi.org/10.1080/03098260601033068>

- Reed, J. (2015). *A hands on introduction to GeoBlacklight—GeoBlacklight Workshop*. Geoblacklight.Org.
<https://geoblacklight.org/tutorial/2015/02/09/a-hands-on-introduction-to-geoblacklight.html>
- Sadvari, J. (2019). Mapping concepts to locate learning opportunities: Aligning the ACRL framework to the GIS&T body of knowledge. *Journal of Map & Geography Libraries*, 15(2–3), 101–133.
<https://doi.org/10.1080/15420353.2020.1719270>
- Sadvari, J., Koshoffer, A., Gorham, R. B., & Phillips, K. (2020). GIS Day across the Association of Research Libraries: Outreach, Education, and Collaboration. *Journal of Map & Geography Libraries*, 16(3), 283–299. <https://doi.org/10.1080/15420353.2021.1944950>
- Slayton, E., & Benner, J. G. (2020a). The role of libraries in geography and GIS education: A report on conversations about libraries, geography, GIS and education. Carnegie Mellon University, 37 pages.
- Slayton, E., & Benner, J. G. (2020b). Using spatial storytelling as an approach to teaching GIS and spatial literacy skills. *Journal of Map & Geography Libraries*, 16(3), 300–316.
<https://doi.org/10.1080/15420353.2021.1964673>
- Walshe, N., & Healy, G. (Eds.). (2020). *Geography education in the digital world: Linking theory and practice*. Routledge.
- Zhang, S. (2020). Expanding library GIS instruction to web mapping in the Age of Neogeography. *Journal of Map & Geography Libraries*, 16(3), 264–282. <https://doi.org/10.1080/15420353.2021.1935399>
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