We hope by this point you are convinced that critical place-based inquiry is an effective pedagogy. When you decide to head down this path there are many resources that can assist you in your journey. In this chapter, we will look at some of the technology tools that can be leveraged for reading the world, understanding how place matters, and telling stories from multiple perspectives. While the technology available for place-based learning will undoubtedly change in the coming years (and even months), we thought it worthwhile to explore the types of tools currently available as well as a conceptual approach to using those tools. This is a non-exhaustive list; we included tools we had success with, and tools that are gaining in popularity. We will also review several place-based learning projects that support inquiry and engage learners. We conclude by discussing some of the new directions in the field. These are only a few examples, but we hope you’ll find them as inspirational as we did.

Leveraging Technology with Place-Based Learning Tools

Place-based inquiry can occur with low-tech tools. Consider a very simple inquiry activity where students use paper and pencil to sketch a map of their community. Or imagine an assignment where students walk along a path taking a series of photographs to record their observations. Indeed, there are many situations in which these low-tech options are not only
appropriate but advisable. For example, when working in a crowded area, groups of students pulling out mobile devices may be difficult or draw unwanted attention to themselves. In both of these cases, students must return to the classroom to transfer their observations to a map. Think about the inquiry process—by attaching information to a map, students can create and visualize a two-dimensional representation of our three-dimensional world (Fig. 5.1).

The inquiry process can be used with low-tech approaches such as a hand drawing on paper or by using a camera, as well as with higher tech options that include handheld devices and apps. The main difference between low-tech and higher tech activities is the lag between data collection and analysis, the ability to collaborate online from anywhere, and the analysis possibilities offered by the layering of datasets in GIS.

In the section that follows, we will discuss three ways to leverage technology using different kinds of technology tools that are particularly well suited to the main components of our critical place-based inquiry model:
1. Data-collection tools for reading the world
2. Analysis tools for understanding how place matters
3. Place-based storytelling tools for sharing multiple perspectives.

Data-Collection Tools for Reading the World

Place-based exploration gives students the chance to situate their learning in authentic environments, capturing data on complex phenomena from multiple angles of observation. Students can read the world by gathering information, making observations, and posing questions about their community or the environments that are being studied. Technology tools that assist students as they read the world make it easier to build connections between the field experience and the desired learning outcomes. By leveraging technology, it is possible to transmit data from the field to the classroom with ease using guiding questions to structure the inquiry. Remember from Chapter 1 Elizabeth’s early attempts with her students to capture images and locations onsite using a digital camera and GPS unit? When the students returned to the classroom, they uploaded the information onto a map. Since that initial excursion, smartphones and tablets have made for a much more seamless experience, especially when the device is able to post the data directly to the online map while students are still in the field. For users who don’t have connectivity from the field, some of these apps are able to capture the data, store it locally, and upload to the online map once the device is back online.

In addition to being able to upload data directly to a map, another important consideration is the ability to use some type of customizable webform. Creating a set of guiding questions to scaffold the learning helps students focus on the specific task for that particular excursion. The webform should not only have the ability to have customized questions, but allow for uploading media files and pin them to a specific location on a shared map. Because students are using a shared map (either with their group or the entire class, or perhaps even other sections), this type of map may sometimes be referred to as a “crowdsourced” map. Three common technology tools that are readily accessible for place-based inquiry are Esri apps, Ushahidi, and Google MyMaps.

Esri (https://www.esri.com/) offers a number of customizable apps that feed geolocated data into a shared online map. The first one we used was Collector, and then Survey123. Both of these apps allow students to collect data in the field. While Survey123 was originally limited to adding
form data to a specific geopoint and Collector was better suited for lines and polygons, the functionality of these two apps has become more integrated. The main difference between these apps is whether the primary focus is using a form (Survey123) or using a map (Collector). Esri also has a web-based GeoForm application. In 2020 they released QuickCapture; while not as robust, it is simple to use and may be appropriate for your students to enter data more quickly with its easy-to-use button interface. Esri site licenses can be expensive (check to see if your school or university already has one, as Esri is used across many disciplines for GIS analysis); free accounts are available for U.S. K-12 public schools. Individuals can sign up for a free “public” account with limited capabilities, and there are also free “developer” accounts with greater capabilities that limit the number of “credits” used per month. Esri apps can also work offline to collect data that can be uploaded once the device is connected to the internet.

Ushahidi (https://www.ushahidi.com/) was developed in 2008 to map post-election incidents of violence in Kenya. Even without smartphones users could snap a photo with a mobile device and then text it to a crowdsourced map. Since then, this nonprofit with a small staff has developed several products, mainly for crisis mapping. These include Mahallah, an app debuted in April 2020 to allow users to create a neighborhood “minisite” to map local community resources, especially during the COVID-19 pandemic, and connects directly to WhatsApp groups, web forms, and other tools. The Ushahidi platform can be used with a mobile app and web interface. The cost of this program varies according to the plan, with a free trial available. The application is open-source and customizable.

Google MyMaps (https://www.google.com/maps/about/mymaps/). While Google is both free and familiar to many users, using their mapping capabilities for capturing data in the field is not a seamless experience. Still, we thought it would be a worthwhile option to mention how this could be used in place-based learning. By using the MyMaps tool, Google users can use the web interface to add new markers with text and images or video, as well as lines or polygons, and Android users can use the MyMaps app (other mobile platforms such as those on iPhones are not able to add markers and data to the map; the MyMaps app is available only on Android phones at this time). MyMaps can be shared, and from the web interface, additional data can be added by
uploading a spreadsheet or editing the MyMaps data table and adding columns.

Using a form with customized questions that feed into the online map is possible with a few steps. By using a Google forms with the question prompts, responses can be collected in a spreadsheet (such as Google Sheets) and those can be imported into MyMaps. At this time, Google forms does not support geopoints as one of the question types, but it is possible to add a script that adds the location or autocompletes addresses. Since Google is always updating their features, it’s possible this may be easier in the future.

**Other Apps to Watch**

Rather than generating an exhaustive list that will likely change within months of the release of new tools, we present a few types of technologies that are currently available. Just as Google forms is a survey tool that can be repurposed to add entries onto a map, there are other form-creation tools that can be used in a similar manner to collect data in a spreadsheet and be imported manually onto a map. Additionally, there are other apps that can be used by students for capturing data as they “read the world.”

**Mapillary** ([https://www.mapillary.com/](https://www.mapillary.com/)) is a platform that crowdsources street-level imagery, and then uses machine learning to identify objects (e.g., street signs, entrances) from the submissions in their mobile app or from browser-uploaded geotagged images. This large repository of images is a good resource to use when students are unable to visit the location under investigation. Anyone can create an account and submit images, and anyone can view the street-level images. This tool does not have a form that instructors can edit to guide students during the data-collection process, nor does it display the captured images in a way that easily tells the story of place, but Mapillary does work well with other tools that can embed the street-level images, such as Esri’s StoryMaps or ArcGIS Online (Mapillary and Esri are partners). Similar apps and platforms such as Pushpin OSM, OSM Tracker, and Open Street Cam are free to use to capture or display street-level imagery, but again, would work best paired with other tools.

**Eduloc** ([http://www.eduloc.net/](http://www.eduloc.net/)) is a platform and mobile application designed specifically for educational use. Teachers or student teams can create a “scenario” that allows for multiple contributions by using
the free mobile app to pin photos and descriptions to a Google map. The platform also supports treasure hunts, quizzes, and a “time machine” that can display changes over time.

**Citizen science apps** are tools that can be used for capturing data onsite. This category of apps is often designed for a specific purpose, such as history (HistoryPin, https://www.historypin.org/), biodiversity (iNaturalist, https://www.inaturalist.org/), or global health (SciStarter’s COVID-19 Citizen Science, https://scistarter.org/the-covid-19-citizen-science-project). Brovelli, Ponti, Schade, and Solís (2020) provide a helpful overview of these different types of citizen science and volunteered geographic information (VGI) initiatives. These individual apps may be overly specific for your own use, so consider developing an in-house app by partnering with computer science faculty and students at your institution (see for example University of San Diego’s World Interactive Study Environment app, https://sites.sandiego.edu/wise/).

**Analysis Tools for Understanding How Place Matters**

Once the data-collection phase is complete, students will spend time analyzing the data. To gain an understanding of place, students need to notice what can be seen and what is missing. The analysis process requires students to reflect on and interpret their observations. In addition, students need to consider how their own perspective or social location might influence these observations. While there are many tools that allow users to *visualize* the data (i.e., see where the data points are on a map), using geographic information systems (GIS) software is the most powerful tool for *analyzing* data. By importing layers to overlay on top of the student-collected data, students can create models and look for patterns. With increasing amounts of publicly available spatial datasets, students can import data from local municipalities, research projects, government agencies, and public domain initiatives such as Planet OSM (https://planet.openstreetmap.org/) or Geofabrik (http://www.geofabrik.de/). Esri’s ArcGIS Online is a powerful commercial tool for analysis that provides access to a wide range of datasets (and can manually import datasets from other sources) that can be used for modeling and analysis. As mentioned earlier in this chapter, the free accounts have some limitations and unless users are teachers or students in a U.S. K-12 school, there is a cost associated with using their commercial product. Similarly, Morphocode Explorer (https://explorer.morphocode.com/) has some
free GIS and data visualization tools, but access to their full service has a cost. Fortunately, there are numerous open-source GIS platform options that are free to use, QGIS (https://www.qgis.org/) being the most popular. Those familiar with the R statistical programming language can use R for spatial analysis.

Web-based GIS tools make it possible for teams of students to collaborate during the data analysis phase of place-based inquiry. The student discussions that take place during analysis are critical to the learning process, regardless of whether the conversations take place online or face-to-face. In both cases, students can be supported when they use a technology tool to organize their tasks. It may not be important that all students in the entire class use the same tool, so if you want the groups of students to choose their own technology, be sure to set aside time, suggest options, and offer instruction for each team as they choose how they will communicate. Plan time for students to learn how to use each tool—do not assume that all students already know how to use the tool for collaboration.

If discussions will largely take place in the classroom, then a simple task-organizing tool such as Trello (https://trello.com/), Padlet (https://padlet.com/), or Google Keep (https://keep.google.com/) is useful for keeping track of the tasks on a to-do list. For more robust online discussions, tools such as Slack (https://slack.com/) can support both conversations and organize tasks. Even a simple Google Drive document can use the comment feature for hosting conversations, and has a task-assignment feature. And of course, most learning management systems (Blackboard, Canvas, etc.) also have a group collaboration space.

**Storytelling Tools for Sharing Multiple Perspectives**

Spatial stories or narratives can shape the way we experience a place as well as the way students engage in place-based learning. The process of constructing these stories requires students to organize their findings, draw conclusions, and communicate their findings to others. As these stories are shared with others, students can reflect on how one’s personal perspective might influence the results of the inquiry process. There are a number of technology tools that make it possible to communicate the story (or stories) of the place under investigation in dynamic ways. Visualization tools for spatial representation of geolocated data are useful. This
is what Esri’s StoryMaps (https://storymaps.arcgis.com/) was specifically designed to do—it allows the students to embed their maps and other media, and has text boxes where they can add narrative to tell the story. Other visualization tools such as Google MyMaps can display the text and images collected, and when integrated within a Google Site that includes text boxes, can accomplish much of the same. There are some educational visualization tools that were created to support maps (such as VisualEyes, http://viseyes.org/) and some that were not specifically designed for mapping can be repurposed for place-based storytelling (such as Thinglink, https://www.thinglink.com/). In the next section, we broaden our scope to review some projects so that you can get an idea of what place-based inquiry might look like.

**Place-Based Inquiry: Projects for Inspiration**

Given the widespread interest in place-based learning, we see a number of projects being showcased in national and regional clearinghouses such as the National Science Foundation’s STEM Learning and Research Center (Stelar, http://stelar.edc.org/) or centers at the local level such as The Center for Place-based Learning and Engagement (https://promiseofplace.org/). In this section we selected a sampling of inquiry-driven projects, with the goal of inspiring other educators to create their own learning adventures!

*Digital East St. Louis (https://eaststlouisculture.siue.edu/omeka)*

This project is a good example of how urban place-based learning can be combined with an effort to promote the career interests of minority youth. The main goal of this extracurricular project is to encourage students who live in East St. Louis to become interested in using technology tools in the process of learning more about their local community as well as exploring possible careers in computer science or information technology. The Coding for Community project offered a free day camp for middle school students who met over the summer and continued with several follow-up sessions during the school year. Students created a web-based community map using a range of technological tools including videography, video editing, web design, sound editing, podcasting, computer programming, and blogging. The resulting Omeka site, which is titled “Digital East St. Louis,” features podcasts, oral
histories, interviews, documentaries, walking tours and digital exhibits. Students played an active role in identifying community events that were important to them, as well creating the artifacts that were displayed in the online community resource. This project was supported by a National Science Foundation grant that included professional development for teachers as well as longitudinal data tracking student self-efficacy, technological skills, and awareness of IT and computing careers.

For additional information refer to:

Digital East St. Louis website (https://eaststlouisculture.siue.edu/omeka/)

Education Development Center’s STEM Learning and Research Center. (2020).

NSF—Stelar Project website (http://stelar.edc.org/projects/14649/profile/digital-east-st-louis-urban-place-based-learning-model-promote-information)

Environmental Literacy and Inquiry Curriculum (https://eli.lehigh.edu/)

Using a common inquiry framework, this interdisciplinary curriculum includes a series of five place-based investigations that focused on the following themes: energy, tectonics, climate change, land use change, and socio-economic science investigations. Each investigation tracks the inquiry process, beginning with an evaluation of students’ prior understandings and continuing to a series of inquiry activities. For example, the Land Use Change project focuses on the way people shape environmental changes through land use. Examining change over time, students investigate sprawl and development based on their readings of aerial images generated from geospatial information technology tools such as Google Earth and remotely sensed images (see the Environmental Literacy and Inquiry Curriculum website https://eli.lehigh.edu/land-use-change). Inquiry activities include geospatial-supported investigations and laboratory experiments. As students proceed through the scaffolded activities, instruction is modified based on the student responses to these activities. And finally, student progress is assessed using geospatial tools. For example, students do a spatial analysis and create a proposal for locating a new Walmart Supercenter in the local area to have minimal environmental impact.
A second place-based inquiry associated with this project is the Socio-environmental Science Investigations (SENSI), which includes a series of “geospatial investigations that focus on social issues related to environmental science” (Environmental Literacy and Inquiry Working Group at Lehigh University, para. 1, 2020). Students use geospatial tools like Esri Collector to gather georeferenced data near their school. The student-collected data is then shared and analyzed using web-based GIS and interactive mapping visualization tools. The project develops students’ geospatial thinking and analytical skills while they address local environmental problems. For example, in the Trees and Ecological Services project, students learned about the benefits of trees as well as the relationship between tree distribution and crime in the city using geospatial technologies to map trees that were in close proximity to their school (Carrigan et al., 2019).

*For additional information refer to:*

Carrigan, J., Bodzin, A. M., Hammond, T. C., Rutzmoser, S., Popejoy, K., Farina, W., Hanson, I. Salter, S., Anastasio, D., Kangas, S., Holland, B., & Sahagian, D. (2019). Investigating urban trees. Exploring the impact of trees around our school with geospatial technologies. *The Science Teacher, 86*(8), 27–35.

Hammond, T., Bodzin, A., Popejoy, K., Anastasio, D., Holland, B., & Sahagian, D. (2019). Shoulder-to-shoulder: Teacher professional development and curriculum design and development for geospatial technology integration with science and social studies teachers. *Contemporary Issues in Technology and Teacher Education, 19*(2). Retrieved from https://www.citejournal.org/volume-19/issue-2-19/current-practice/shoulder-to-shoulder-teacher-professional-development-and-curriculum-design-and-development-for-geospatial-technology-integration-with-science-and-social-studies-teachers.

*CitizenGIS (http://www.citizensciencegis.org/)*

With a focus on developing citizen science and community GIS skills among undergraduate students as well as K-12 educators, CitizenGIS funded projects in Orlando, Florida, and Belize. These projects included using drones to map reef ecosystems, a mobile citizen science lab, and surveying residents’ sense of place as it relates to restoration of a local lagoon. During the COVID-19 pandemic school closures, they shared
their drone imagery captured in Belize, offering “At Home Map Digitizing” activities for young learners. One of the collaborations that Citizen Science GIS organization has been engaging in is The Open Mapping Data for Hopkins Village Belize project (http://hopkinsvillage-ucfonline.opendata.arcgis.com/). This community-driven site is a partnership between Hopkins Village Council, Miss Bertie’s Hopkins Community Library, University of Belize, University of Central Florida, and Citizen Science GIS, and offers openly available data and drone imagery, as well as story maps exploring science and society partnerships in the village.

**Community Mapping Lab** (http://www.communitymappinglab.org/)

Researchers at the University of Georgia have several projects underway that involve university students working with community members to empower marginalized populations. The stated goal of the Community Mapping Lab is to “foster collaborative research partnerships, develop innovative approaches to engaged research, and create public conversations related to community development, community engagement, cartography, and spatial analysis” (Community Mapping Lab, Department of Geography, University of Georgia, para. 1, 2020). In university courses, faculty and students use geospatial technology and work with established community partners. Past projects include mapping social services for a local nonprofit, creating a multimedia story map of local African-American owned businesses, and using home sales data to analyze the impact of the 2008 recession and gentrification over time. In the next chapter, we’ll talk more about the importance of developing community partnerships such as those underway in this project.

**Additional Projects for Inspiration**

Even though the following place-based inquiry projects are no longer active, we include them here because they offer helpful models for imagining the many different ways that place-based inquiry can be designed.

The goal of the Innovation in Urban Science Education—Urban Ecology ITEST (Innovative Technology Experiences for Students and Teachers) project was to explore ecosystems within a social context that
was relevant for students. Barnett refers to this as the “contextualization” of science by bringing the science of how ecosystems work and connecting them to people in urban areas (EDCWorldwide, 2009). In one instance, students pursued inquiry questions that were under investigation by “real” scientists by following up on an article they read in Nature Magazine. They were able to collaboratively collect and analyze data to help answer questions about how the noise of cities impacts bird communications. In a tree economic impact project, they asked research questions, collected data on air quality, and recommended changes based on their findings, in essence, acting as urban planners would (EDCWorldwide, 2009). When evaluating the student experience on this project, researchers found that students not only gained a better understanding of course content, but they also gained an appreciation for the role that technology could play in doing science. Students’ confidence in using technology increased as well (Barnett, Houle, Mark, Strauss, & Hoffman, 2010).

For additional information refer to: Innovation in Urban Science Education website (http://iuse.bc.edu/)

Barnett, M., Houle, M., Mark, S., Strauss, E., & Hoffman, E. (2010). Learning about urban ecology through the use of visualization and geospatial technologies. *Journal of Technology and Teacher Education, 18*(2), 287–317. Waynesville, NC: Society for Information Technology & Teacher Education. Retrieved from https://www.learntechlib.org/primary/p/32353/.

EDCWorldwide. (2009, August 18). *Students shape urban planning (ITEST Massachusetts)* [Video]. YouTube. https://youtu.be/y6fO6ECHNJ4.

This next project involved what the Open University referred to as location-triggered learning in an example of guided inquiry—following a predetermined path of inquiry as users navigates an urban area. MASELTMOV stands for “Mobile Assistance for Social Inclusion and Empowerment of Immigrants with Persuasive Learning Technologies and Social Network Services” (www.maseltov.eu/). This single app functioned much like a city tour guide, and contained a number of services that
were helpful to new immigrants such as points of interest, pedestrian and transportation navigation, and language learning.

For additional information refer to:

Gaved, M., & Peasgood, A. (2015). Location-based language learning for migrants in a smart city. In Proceedings of the 15th International Conference on Technology, Policy and Innovation. The Open University. Retrieved from http://oro.open.ac.uk/43797/1/Gaved-ICTPI2015-abstract.pdf.

Gaved, M., Peasgood, A., & Kukulska-Hulme, A. (2018). Learning when out and about. In R. Luckin (Ed.), Enhancing learning and teaching with technology: What the research says (pp. 76–80). London: UCL Institute of Education Press. Retrieved from http://bit.ly/2BPGd0z.

In all of these examples, students were engaged in place-based inquiry that leveraged technology tools. In some cases, the inquiry process was highly structured, in other cases students were given a starting point (research question) and determined the direction from there. Whether the technology was used to help students learn the scientific method or to help recent immigrants feel more comfortable in their new home, in each case the technologies bridged the gap between the field excursions and classroom instruction. In the next section we’ll take a closer look at specific place-based inquiry projects.

**Place-Based Inquiry in Focus**

The next projects demonstrate what place-based inquiry looks like in action as implemented within an academic course. While several of the examples described in the previous section utilize place-based learning that focuses on human interactions within contemporary community contexts, place-based learning can be used in many disciplines and explore natural and historic environments as well. These next examples were shared with us by colleagues who designed these place-based learning experiences for their interior design, biology, sociology, and history students.
**Reading the World: Making Observations Anchored in Place**

*Urban Sketching—Moira Denson, Interior Design*

One of the most fundamental skills in place-based learning is learning to observe. While we commonly think of this being a visual activity, this interior design activity requires students to consider the emotional and sensory experience of a place—an important capability for interior designers. Here, Dr. Moira Denson describes an assignment for her Advanced Sketching and Rendering course that gets students to consider these multiple dimensions of observation in a place, and provides a good example of how to frame field assignments that scaffold the process of making connections:

“Final Project: Spirit is in the Details - Height, Light, Might” asks students to document and design the emotional and sensory experience of sites within the Washington DC metro vicinity. Mapping their observations through photographs and onsite sketches in their sketchbooks, students developed a narrative of their sensory experience of the sites. The following four watercolor drawings highlight the sensorial experiences along with an emphasis on a particular material detail: Visual (sight), Auditory (hearing), Oral (taste), Haptic (touch), Scent (smell). Students brought their studies back to complete in the studio.

Height (gravity, visual weight, thickness) @ Site 1

Light (reflectivity, glare, translucency, etc.) @ Site 2

Might (volume, gravity, rigidity, thickness) @ Site 3

Composition Abstract Drawing- Maps sensory experience between the three sites.

Ink and watercolor were the chosen mediums for their quick application to support urban sketching “on the go” techniques demonstrated by both the instructor and course textbook author Marc Taro Holmes (*The Urban Sketcher*).

For more information, see Moira’s Instagram posts @moiradenson.
Understanding How Place Matters: Analyzing Spatial Patterns

Tracking Sea Turtles—Todd Rimkus, Biology and Physical Sciences

This example provides a good illustration for how Marine Biology and Tropical Ecology students are developing their spatial thinking by mapping sea turtle movement. Using an authentic learning environment, students can “map for a better world” as they collaboratively analyze their geolocated data and make real-world decisions while working within a community partnership. Here Dr. Todd Rimkus describes this experience:

Each year since 2011, Marymount students participating in the Marine Biology and Tropical Ecology study abroad program in Belize have been able to witness sea turtle nesting and the tagging of a sea turtle. Walking the beach each evening in anticipation of finding a sea turtle is a tough task, but the reward when one is spotted is a once in a lifetime experience that these students will share with classmates and can talk about for many years to come. The tagging process uses an epoxy based glue to affix a temporary satellite tag to a nesting female Hawksbill sea turtle. The satellite tag will then communicate with satellites each time the sea turtle surfaces to breathe. The ARGOS satellite system then records the position of the sea turtle and transmits that information in an email. The system collects all of the data from each of the sea turtles we have tagged over the years to give us great information about the travels of these turtles once they are released. The tags transmit for several months up to two and a half years depending on luck and at which frequencies the tag is collecting data. By mapping the satellite data, we are able to get a picture of where the turtle has traveled. We know when she nests again, we know where she spends most of her time, and we know when she is actively swimming. Through these maps we can identify the best resting and foraging grounds for these sea turtles. Our data is shared with the Belize Fisheries Department. They can use the data to help manage sea turtle interactions with fishermen. The goal is to display clearly the areas most used by sea turtles so those areas can be protected for future use by all of the sea turtles.

The course goals related to place-based learning is to expose the students to the tagging process and letting them know that biology is not always easy. Understanding the data is also necessary as you need to understand error signals and poor location data and be able to eliminate those from the data set. Once we get data on the turtles, we need to be able to define areas that are used by the turtles and so map reading is a skill that is built in. The data is plotted on to that map and the data is listed as coordinates,
so those skills and abilities are put to test as well. The final product is a map.

For more information, visit the project website at http://www.hawksbillhope.org/.

**Leveraging Technology: Developing Skills Using Technology Tools**

*Zillow Crawl: Delario Lindsey, Sociology*

It is important to give students a chance to feel comfortable with technology during initial fieldwork. In this assignment students in Dr. Delario Lindsey’s class on Poverty, Wealth, and Inequality begin their investigation in the classroom by examining online maps and census data before entering the field. From there, the students are asked to walk through a historically African-American neighborhood that is located near the university’s campus. While onsite, students record observations using low-tech methods (notes and photographs). In addition, they access an online app to look up information on individual sites using mobile phones. This is the type of an experiential activity that serves as a foundation for the more complex uses of technology of layering data using GIS. Here are his instructions for this assignment:

**Introduction:** This is your opportunity to connect some of the ideas and concepts we have discussed in class to features of the real world. We have been exploring ideas like social distance (separation based of social indicators like wealth, income, educational attainment), and social difference (separation based on identity indicators (ascribe traits like race/ethnicity, sex, religious affiliation)). As you explore the community of Hall’s Hill/High View Park, think about the many changes that have taken place there (remember, Census data indicates that the housing stock in that community goes back to the 1930s). Think about how changes in the make-up of the community reflect increasing social mobility as well as increasing social inequality.

**Your task:** Spend an hour or so exploring the community of Hall’s Hill/High View Park, and describe what you see in words and pictures. Look for contemporary and historical expressions of social stratification and inequality. Identify indicators (visual evidence) of separation, stratification or social inequality. Use the Zillow app, available for iPhone and Android devices, to determine the value of a few homes that interest you.
Are the home values consistent with the median household income for the area (around $106,000 a year)? Generate a four-slide presentation of your exploration, not including title page and works cited. Be prepared to present your findings to the class. Be sure to cite your sources, ASA style. Please take the time to follow the links I provided to learn a bit more of the history of this community.

Considerations:

1. Is there evidence of social stratification? If there is, describe it (using words and pictures).
2. Look for indicators of social distance. This is a residential setting, so social distance would be most noticeable in differences between housing structures, landscaping, etc.
3. Look for indicators of social difference. Consider the history of racial segregation in the area (hint: be sure to check for remnants of the cinder block wall). Contemporary manifestations of social difference could appear as community change (gentrification?) or shifts in the racial/ethnic demographics of the community.
4. Consider the Zillow value of some of the properties in the community, and think about the types of families that can afford to live in them.

Tell Stories of Place from Multiple Perspectives

Civil War Tour: Cassandra Good, History and Politics

This history project provides another example of how place-based learning can help build discipline-specific skills and tell stories from multiple perspectives. Note how Dr. Cassandra Good is focusing the assignment on key concepts and course themes, which include the experience of groups who are often left out of history books such as the roles of women and African Americans during the Civil War.

In the spring of 2019, I taught the Marymount University history department’s course on the Civil War and Reconstruction with a public history focus. Our department offers a minor in public history, which trains students to work in museums, archives, and historic sites. Such work often requires historians to interpret a specific place in historical context for visitors. In order to allow students to practice this skill, I designed a walking tour project as the major assignment for the course.
In groups of three or four, students were tasked with designing a walking tour with six to eight sites in one neighborhood. Since my university is located just outside of Washington, DC in Northern Virginia, there is a huge range of sites from the Civil War and Reconstruction eras (1848–1877). These included monuments, historic structures, sites of important events, and cemeteries. There is no comprehensive list of such sites, so I created a spreadsheet organizing the sites by neighborhood.

Each group chose a neighborhood, a theme for their tour, and the sites they would include. Themes included civilian involvement in the war, women’s roles during the war, and the role of African Americans throughout the era. Relying on readings from a book on historical interpretation to explain the various components of a tour program, each group identified the tour’s goal, audience, objectives, and theme, as well as providing a tour introduction, information for each site, and a conclusion. Each site needed to include a title, date, and associated names; an image; history of the physical structure; information on its role in the Civil War/Reconstruction era; and a bibliography. The assignment was scaffolded, with students turning in drafts of their work throughout the semester to receive feedback. I also worked with the library to put several books on DC-area Civil War sites on hold and showed students how to find and read Historic American Buildings Surveys online.

All groups had to turn in a final tour program as well as post their tour on the crowdsourced website Historypin.org. The site works off of Google Maps and its user interface is very simple, allowing users to pin their sites to the proper geolocation and add in-depth information and images. My goal was for students to make a spatial representation of their tours with the lowest possible technical barriers, although unfortunately this site was a bit slow and clunky to navigate.

Finally, students gave short pitches for their tours to the class and we voted on the two tours the students would most like to take. The last two weeks of class, we traveled to the selected neighborhoods and took the tours. Students who (despite their proximity) rarely visited and navigated downtown Washington, DC, had to learn to do so and to guide their classmates. Ultimately, students were deeply invested in and truly enjoyed learning more about the history of the built environment around them and conveying that knowledge to their classmates.
Chapter Conclusion: New Possibilities for Place-Based Inquiry with Emerging Technologies

Both the pedagogical practices as well as the technologies that can be deployed for learning are evolving, particularly with the advances and widespread adoption of geolocation technologies. Educators can take advantage of the learning opportunities offered by these technologies for critical place-based inquiry learning. From wearable devices such as Fitbits and other trackers that contribute mappable data to augmented reality and artificial intelligence, researchers are investigating how to incorporate these devices into learning activities.

Augmented reality (AR)—overlaying a real-world view with computer-generated data—is already a possibility with our camera-enabled mobile devices and eyewear (remember Google Glass?). Augmented reality is being used in some informal learning areas, such as at the Skin and Bones exhibit at the Smithsonian Natural History Museum where visitors can use the tablet or phone app and, pointing the camera at the exhibit item, view an overlay of fur and skin onto animal skeletons to visualize how the animals would have looked. In this example of image-based augmented reality, the target is detected by a camera, and displays the augmented components to appear on screen—in this case, the fur and skin. In a geography course Turan, Meral, and Sahin (2018) used image-based AR with first-year university geography students, and found AR increased their achievement and decreased their cognitive load levels by helping students turn abstract concepts into concrete concepts.

Location-based AR is even more promising for place-based inquiry, such as those applications that use GPS to pull up onscreen digital content. This is the technology used in the popular Pokémon Go game, as well as by some tourism and advertising apps. This same technology can be extended easily to critical place-based inquiry. In place-based inquiry, being able to seamlessly overlay data from a field location onto what you are seeing through your mobile phone or tablet enables preliminary analysis to take place in the field or offers scaffolding during fieldwork.

Location-aware devices can already utilize geofencing, which is when your device recognizes that you are at a location. For example, a device in your house can recognize when you are arriving at home, and adjust the thermostat and lighting accordingly. Stores can use geofencing to monitor your arrival and make it easier for you to pick up your order.
As geofencing capabilities increase, there are more opportunities to incorporate this into educational contexts.

Learning events can be triggered as students near a particular location. Since the teacher cannot always be at the shoulder of the students, more evolved personalized learning systems that are “situationally aware” can help keep students on track (a personalized learning system tailors the learning tasks and content toward an individual student’s characteristics and progress). While students should be at the center of the inquiry experience driving the questioning process, we must provide the guidance and scaffolding that they may need, particularly for those who are less experienced with independent learning and inquiry. Chatbots can answer questions and give suggestions through simulated conversations. With the evolution of personalized learning systems, more sophisticated conversational agents/artificial intelligence will play an increasing role in these educational field experiences. Even with this additional scaffolding, students still need guidance from their instructors.

The Internet of Things (IoT) is feeding large amounts of location-based data from these internet-connected sensors and devices, and these data can be dynamically mapped to provide real-time spatial analysis. As technologies such as 5G and edge computing become more advanced, so will the capabilities to analyze IoT-generated data. When students are using GIS for their analysis of place, they can overlay up-to-date datasets alongside their own field-collected data to look for geographic patterns. Live video feeds, connected sensors, latest weather states, Twitter and Instagram feeds, and bus locations are examples of these data that can be dynamically pulled in as a layer for analysis in GIS (Harder & Brown, 2017).

With the increasing amounts of data being produced, industries are turning to artificial intelligence (AI) to make sense of the information; location-based data in particular can utilize AI, or location intelligence, for predictive modelling, space analysis, detecting and quantifying problems, and planning for operations and management (Esri, 2019). Location-based data are not confined to outdoor locations; beacons and Apple’s indoor positioning technology provides 3D visualizations of building interiors.

Geospatial technology continues to become simultaneously both more robust and more accessible, particularly with the shift of GIS functionalities and content to a browser-based internet platform. GIS can serve as an online laboratory for learning, where students can “experiment” in various layers and ways of representing data. Geospatial technology has
been attached to various disciplines, but now with more recognition and acceptance of interdisciplinary approaches, schools will increasingly look to this interdisciplinary technology to address STEM and computational literacy/thinking. It is also being recognized as a useful skillset for the job market.

**Geospatial Projects for Social Change**

With the growth of the geospatial industry, technology tools are being used to address societal and environmental challenges of our times. There have been some interesting initiatives in the areas of geography and geospatial technology that have the potential for social change. GeoChicas is a global community of women mappers who have been utilizing OpenStreetMap to address the gender gap in mapping, and have conducted a number of projects using open-access maps, GPS, and photos they took; for example, GeoChicas conducted interviews throughout Oaxaca, Mexico and mapped shelters where women felt safe, which was particularly important following the November 2018 earthquake when many residents had to move into temporary public shelters (Bayona, 2020; Mukherjee, 2019). In early 2020, a Canadian firm used AI and geolocated datasets that pulled even unstructured data from news stories in dozens of languages, reports from plant and animal disease tracking networks, and airline ticketing data to simulate, predict, and track the global COVID-19 spread better than algorithms that relied on public health data (Janeja, 2020).

In 2012, the U.S. National Science Foundation and later the European Commission awarded funding to both American and European geographer organizations for the Geocapabilities project (http://www.geocapabilities.org). This project aimed at supporting teachers as curriculum leaders in order to provide students ways to understand the world and go beyond their everyday experience. Motivated by social justice, this project frames the importance of powerful geographic knowledge which is linked to wider educational aims: the ability to think and reason; relational understanding about ourselves in the environment and society; global citizenship; understanding the global economy; and intercultural understanding.

We are already seeing student participation on community initiatives, both inside and outside of the classroom, where young people are using their mapping skills to solve local and global problems. Here we highlight three such projects:
- Humanitarian Open StreetMap Team (HOTOSM, https://www.hotosm.org)
- Open Cities Mapping Project (https://opencitiesproject.org)
- Missing Maps initiative (https://www.missingmaps.org).

All of these projects use crowdsourcing and open map data to identify “vulnerabilities and assets” in communities that require humanitarian assistance. For example, drone and satellite images of refugee settlements in East Africa are posted online, and people from anywhere in the world can go online and help identify buildings and other assets that would help aid workers to target malaria prevention activities. The Missing Maps project then conducts “ground truthing” by going into the community that has been mapped to make sure the information is accurate and to talk with community members about additional details or local names that could be added to the map. The ethics of remote sensing are an important consideration for this type of project, which we will discuss further in the next chapter. While there are benefits to these data, there is also the potential for misuse and surveillance, and, especially with the higher quality resolution of satellite images available now, introducing some important questions about data transparency as well as privacy.

When communities organize their projects for socio-economic development and disaster preparedness, the resulting projects increasingly mobilize young people, or “maptivists,” to assist with the mapping activities. The international group YouthMappers has university chapters all over the world to promote student “mapathons” to contribute to the HOTOSM initiative. In 2017, Elizabeth met with the student leader of a YouthMappers chapter at Mbale Christian University in Uganda. These maptivists went into the nearby rural area to identify and map microfinance locations so that local people could find financial assistance with a minimum of travel, which can be difficult and costly. Projects such as these are aimed at making the world a better place, part of a new vision for the goal of education to empower our students. As we discuss in the next chapter, it is essential for community partnerships to guide this type of student activism, as well as ethical considerations for the use of geolocated data.
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