CHAPTER 1

Place-Based Learning, Geospatial Literacy, and Maps

Place is more than where you go, it’s also why you are there
An excited group of students receive directions to meet at a mysterious destination at a specific time. The students arrive at a cemetery after dark! Their excursion is an introduction to a class being offered by The Pioneers Learning Lab (http://www.thelearninglab.nl), an innovative educational program associated with the University of Amsterdam. “We go literally on a journey in which we do not know what the end station is,” explains the instructor, Thiel Besselink (Smit & van Doorn, 2011, 6:20).

Once on location, Besselink instructs the students to spend their time as they choose: “You are pioneers. So you decide what you do with your time...What are you going to do with your time? And life is short. It’s really short. Tick tock tick tock. So what we’re doing is trying to stretch the boundaries of education, inside and outside of the classroom...inside and outside of your life” (Besselink, as cited in Smit & van Doorn, 2011, 7:15). Taking flashlights, they explore the cemetery and then return for a large group reflection on the activity. Many of the students make profound connections between this introductory experience and the goals of the Pioneer program which they are about to begin. In this example, the location of study—the cemetery—becomes part of the learning journey. Imagine this same activity where the students were shown slides of a cemetery or simply asked to think about being in a cemetery.

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Besselink designed this experiential activity to shift the students’ focus from a teacher-directed to a student-initiated classroom, modeling the experience of going to an unknown rather than prescribed final destination. Being on location played an important role in communicating the purpose of learning. The connections to the learning outcomes of this activity are made clear to the students through the instructor’s facilitation of the group discussion.

When we blur the boundaries of a classroom and expand the locations where learning occurs, as educators, we create opportunities for students to explore place as an important dimension in and of itself. The end result is that students and educators are inspired to imagine adventures that allow for the transfer of learning from an abstract discussion to a concrete exploration with “real” world connections. In this chapter we look at what is known about geospatial literacy and explore the different traditions from which place-based learning emerged.

**What Is Place-Based Learning?**

Place-based learning is a type of experiential pedagogy that puts students in a physical location outside of the school building, allowing the community to become the “classroom.” By engaging with the people or the environment, the students experience learning that is not easily replicated within the walls of a traditional classroom space. The actual process of exploration enables students to establish connections with a site, developing a sense of place. In this approach to learning, the location, whether it is rural, urban, or in-between, is integral to the desired learning outcomes. These learning outcomes are not simply getting to know a geographic location; place-based learning can be a vehicle for learning other academic content. Beyond learning about a place, academic coursework related to biodiversity, language, civic education, design, or sound can be integrated into the experience. Smith (2002) identifies five themes in place-based education that can be adapted to different settings: cultural studies; nature studies; real-world problem-solving; internships and entrepreneurial opportunities; and induction into community processes. In all of these areas, regardless of the setting, our ultimate goal is to transform the way that students interact with their world as well as their willingness to “promote a more just and sustainable world” (Israel, 2012, p. 76).
Long before internet access brought the world into our classrooms, the places where learning occurred were not always limited to the confines of a four-walled room dedicated to the purpose of schooling. Students ventured into their neighborhoods to explore, describe, and analyze, whether it was leaving the one-room schoolhouse out on the prairie or by taking an urban excursion. As we go back to the writings of John Dewey, who was advocating “progressive education,” we see a call for teachers to become “intimately acquainted with the conditions of the local community, physical, historical, economic, occupational, etc. in order to utilize them as educational resources” (Dewey, 1938, p. 40).

The value of place-based knowledge and experiences outside of school is noted by many who suggest having students apply lessons from school to everyday life (Buxton & Provenzo, 2011). Both John Dewey (1938) and Paolo Freire (Freire, 2011; Freire & Campos, 1990) noticed that what children learn outside of school is often devalued. The key difference between these two educators is that Freire links the observation to an analysis of power and privilege. He notes that children from different social classes will come to the classroom with different sets of experiences, with educational systems privileging certain knowledge and skills.

Sobel’s work on place-based education (2004) offers a foundation for understanding how this pedagogy can take advantage of the local community and environment “as a starting point to teach concepts in language arts, mathematics, social studies, science and other subject areas across the curriculum” (p. 6). Through these hands-on, real-world learning experiences, the students:

- Develop stronger ties to their community;
- Enhance their appreciation for the natural world; and
- Have a heightened commitment to serving as active, contributing citizens.

By actively engaging local citizens, community organizations, and environmental resources, Sobel advocates for a place-based learning that contributes to community vitality and environmental quality.

Sobel’s concern for the stewardship of our natural environment is part of several educational movements connected with outdoor education. The term was coined to be in-opposition to “indoor” education (i.e., a classroom) and primarily focused on learning about the natural environment.
Over time, the field evolved to include a range of names and a variety of purposes: environmental education, camping education, and conservation education, as well as experiential and place-based education (Quay & Seaman, 2013). While these approaches share the common feature of learning in settings beyond the classroom, some of them are closer to “adventure” education that focus on the personal growth benefits from overcoming uncertainty and obstacles (Ewert & Sibthorp, 2014). Others foster students’ connection to place by viewing the community as a classroom and encouraging students to “read” the landscape.

Courses that have service or community-based learning (Anderson, 2017), field trip, or study abroad components are naturally suited to place-based learning because they often assume an obvious link to the physical environment. To be effective, these experiences require a thoughtful pedagogy that anchors student learning in a specific place and facilitates the connections between conceptual material and geospatial location. In order to make these learning environments meaningful, a clear synergy needs to be created between out-of-classroom and in-classroom or online experiences. Otherwise, students become academic tourists, passing through their destinations without making connections or gaining an appreciation for the significance of the place.

To address this need for making these learning environments meaningful, some educators have developed place-based activities. The pedagogy of place-based learning is applicable across disciplines and emerged from several different areas. Surprisingly, many of these developments occurred outside of the field of geography (Israel, 2012). An early attempt to reach across disciplines was City as Text, which originated within the Honors Education community. Developed by Dr. Bernice Braid (Braid & Long, 2000) and shared through workshops held by the National Collegiate Honors Council, this technique involves the recursive process of mapping, observing, listening, and reflecting (Machonis, 2008). Resulting excursions involve an extensive planning process, which includes identifying a location and theme, selecting background materials (texts), and creating several participant assignments. More than just exploring a city, the goal for City as Text participants is the critical thinking process that requires students to hone their observational skills and generate questions that require locating additional information. While analyzing a city “as text” is more likely to produce deep learning, it also requires a significant time investment on the part of teachers creating experiences as well as students participating in these experiences.
In *Shatter the Glassy Stare* (2008), Machonis devotes an entire section to ideas for using the City as Text approach on a college campus to build community among a specific cohort of students or to promote positive “town and gown” relationships.

**The Language of Place-Based Learning**

Before going further, we should clarify how we are using the terminology that is associated with place-based pedagogy. Because this approach spans a number of disciplines, we find a variety of terms used, with the most popular reference being to place-based education (PBE). Here we will use the terms *place-based learning* and *place-based education* interchangeably. The term “place” will be used to denote more than the physical location or space as indicated by geographic or map coordinates. Consistent with the discussions found among geographers (Agnew, 1987; Cresswell, 2004; Semken, 2005) and social studies educators (Resor, 2010), we consider two additional dimensions that make it possible to identify the meaning associated with physical locations: locale and sense of place. *Locale* refers to the setting, which could include a listing of prominent objects such as the number of schools in a town, trees in a yard, or traffic cameras at an intersection (Resor, 2010). *A sense of place* denotes “the meanings of and the attachments to a place held by a person or group” (Semken, 2005, p. 149). This term involves a more “sentimental” and subjective notion of a particular geographic location; one person might stand on a corner and observe a vibrant shopping area, and another person might stand on the same corner and see the loss of a community as the result of gentrification.

The same physical location is experienced by various individuals differently, depending on that person’s previous experiences and social location. Sociologists often refer to a person’s *social location* within a given community, meaning a person’s relative position to others in their community. Social location is usually based on group memberships (i.e., race and ethnicity, gender, religious affiliation) and can shape how a specific location is experienced by individuals. Semken, Ward, Moosavi, and Chinn (2017) and Ardoin (2006) extend our understanding by noting how many different ways that meanings can be attached to place:
Place is defined by meaning, and many diverse forms of place meaning—including, but not limited to, aesthetic, economic, recreational, or spiritual value; familial or kincentric rootedness; and cultural, historical, political, or scientific significance—can be associated with the same place, as different individuals and communities will experience it and know it in different ways. (Semken et al., p. 544)

Indeed, all of our life experiences “from cultural traditions to natural phenomena” are defined by the power of place (de Blij, 2008, p. 234). While most efforts at place-based education take into account these contextual factors, we suggest that educators integrate an understanding of how the social, political, or economic power structures define communities, impact the environment, and inform the spatial narratives that our students bring to the classroom when planning course activities.

Learning activities that are designed to take into account these power structures are referred to as part of a critical pedagogy of place. In this book, we will advocate taking into account a critical perspective by acknowledging the importance of:

- the elements of the social context, recognizing that historical and contemporary power structures can and do shape our local communities and the natural environment,
- our students’ initial spatial narratives (Elwood, 2004), and
- reflection on how maps are socially constructed (Crampton, 2001; Elwood, 2004; Monmonier, 2018).

Not only should place-based learning recognize these power structures, but learning activities should also actively promote “social and ecological justice rather than merely learning about the place” by empowering students to become actively engaged participants in their own communities (Israel, 2012, p. 77; Gruenewald, 2003).

Place refers to a geographic location, a sense of place, and a locale (Agnew, 1987). These are all observable from being in a place, but how do we display the things that we observe? Maps allow us to visualize place-based information and data, provided that as map readers we are familiar with basic map reading skills. Indeed, interpreting maps requires its own form of literacy.
Geospatial Literacy

The term *geospatial*, or sometimes simply *spatial*, describes something with a geographic or topographic component: Think maps (it comes from the Greek *geo*, meaning “earth”). *Geo-referenced* or *geolocated data* refer to data that range from numerical statistics or photos to tweets, and are tied to a location on the earth’s surface. Geological or built structures, social or animal behaviors, or even wildlife can all be studied as geolocated data.

Engaging in spatial thinking requires that students use the concepts of space, the tools of representation, and processes of reasoning. The ability to imagine three-dimensional shapes from two-dimensional architectural drawings and to visualize DNA structure as a double-helix, or to rotate a geometric object in your head are all examples of how spatial thinking plays an important role in many different disciplines (National Research Council, 2006). Spatially literate students:

- have the habit of mind of thinking spatially—they know where, when, how, and why to think spatially;
- practice thinking spatially in an informed way—they have a broad and deep knowledge of spatial concepts and spatial representations, a command over spatial reasoning using a variety of spatial ways of thinking and acting, and well-developed spatial capabilities for using supporting tools and technologies; and
- adopt a critical stance to spatial thinking—they can evaluate the quality of spatial data based on its source and its likely accuracy and reliability; can use spatial data to construct, articulate, and defend a line of reasoning or point of view in solving problems and answering questions; and can evaluate the validity of arguments based on spatial information (National Research Council, 2006, p. 4).

Here, we focus on a specific kind of spatial literacy, that of geospatial literacy. Any information or data with a geographic component—meaning it is tied to a physical location—is the type of geospatial data that can be visualized on a map. Geospatial literacy is what we use “to visualize and interpret location, distance, direction, relationships, change, and movement over space” (Sinton, 2012). This means that students are able to “read” geographic information and make connections to where
and when these data occur, and to explore the complexity and interconnectedness of how economic, political, social, or ecological relationships shape experience. Because the role of place—the actual physical location—is important in place-based learning, we need to help our students develop their geospatial literacy, which includes the skills needed to create, analyze, and interpret map-based data. By asking guiding questions such as, “Where do the locations occur on a map?” “What is nearby?” “Who lives there?” “What physical features are present?” “What social or environmental patterns can be observed?” we can develop a foundation for more complex analysis.

The pedagogy of place-based learning asks that students make observations, collect data, and develop a sense of place about a specific physical location. Placing this information on a map enables students to visualize a two-dimensional representation of our three-dimensional world. The role of geospatial literacy includes having students recognize shapes and patterns from among the “clutter” of the data. These are skills that can be learned; just as a radiologist learns how to look at an image to detect an abnormality, we can help our students to develop their own spatial thinking skills to look for patterns in the data.

Geospatial technologies allow users to utilize critical thinking skills to locate, display, and analyze geographic information, and make sense of the increasing amount of place-based data that are emerging. With advances in geospatial technologies (geographic information systems, global positioning satellites, remote sensing, and image analysis, for example), more and more geolocated data are being generated all the time, including soil erodibility and other environmental conditions; sidewalk and transportation access; posts to social media such as Twitter and Instagram; and traffic congestion. This increases the need to teach students the skills to make sense of these data; visual representations of patterns require new visual and geospatial literacies to see interconnections and how actions in one area can impact another. Geospatial technology tools and the understanding these tools can afford users is central to enabling students to become engaged, globally competent citizens (Langran & Baker, 2016).

Geographic Information Systems (GIS) technologies have also evolved dramatically in recent years, increasing the ability for students to access GIS tools through a browser and use these tools to analyze geolocated data without specialized training. Anyone with basic skills to visually interpret images can see that there are more instances of an event on one part of the map than on another part of the map, or that this area on the
map is darker than that area on the map. While there is a certain intuitive aspect to map interpretation, a specific kind of literacy is required to spatially think about the relationships between data points. The best way to represent information on maps requires some level of visual interpretation. While the location of data may be fixed, the way that we choose to array that data must be intentionally designed to communicate the intended message or observation.

In order to facilitate geospatial thinking, we need more information on how people learn to interpret locations, their characteristics, their distances, or their changes over time. For example, do we know whether how people interpret their location influences their relationships with the environment, or with other people? To begin addressing these gaps between what we know about geospatial thinking and geospatial technologies, a research agenda identified three broad research areas that are needed: student learning and outcomes; teacher training; and technical development (Baker et al., 2015). The second of these areas is teacher training where a key question involves the best ways to train teachers and teach students about geospatial literacy. In subsequent chapters, we will discuss ways to structure place-based learning activities that take advantage of what we already know about using geospatial technologies for learning. Some of the key course components that promote geospatial literacy include capturing and communicating knowledge in the form of a map; recognizing and interpreting patterns; understanding geographic concepts of neighborhood, spatial interaction, competition for space, territory, migration, and spatial context; the ways in which humans express themselves visually as they describe and record the world using coordinate systems, data, and map projections; and seeing the value of geography as a basis for organizing and discovering information, not just as a list of places on the Earth’s surface (Goodchild, 2006).

There can be multiple opportunities to develop spatial thinking as we ask students to consider actions performed in space, thinking about space, and thinking with space:

Walking to school, taking a shortcut to avoid a traffic jam, playing a team sport such as football, or packing a suitcase—actions that are performed in space—all require spatial thinking in a real-world or environmental context. The second type of spatial thinking, thinking about space, is typically employed when individuals learn factual information, organized as facts and generalizations, about how the world works. The third type of
spatial thinking, *thinking with space*, is more abstract yet a powerful tool. Spatializing non-spatial data or using space as an organizing framework to conceptualize problems and make decisions is an effective cognitive strategy used frequently in problem solving. (Emphasis added, Bednarz & Kemp, 2011, p. 20)

Together, spatial literacy provides us with the abilities needed to work and reason in a spatial world and make a picture “truly worth a thousand words” (Goodchild, 2006, p. 5). Maps are one such picture that requires a sufficient level of geospatial literacy.

**Mapping**

Central to place-based learning is *contextual learning*, and maps are a tool that can visualize and scaffold this type of understanding. We can take the conceptual ideas being learned in environmental studies, urban planning, language learning, or other academic areas, and apply them to real-world venues. When academic concepts are presented abstractly, it is up to the learner to make connections to the world where they will live and work. When course instructors help make these connections by providing learning in the context of real-world applications and engaging authentic learning environments, students can better internalize these concepts (CORD, 2016). Maps can serve the learner as they explore an area with the intent of making connections between classroom knowledge and the real world. Mapping contributes to critical, multidimensional thinking, specifically: categorizing and interpreting information; analyzing and evaluating; and making inferences (Sinton & Bednarz, 2007).

When we anchor the analysis of a place using mapping, students develop the skills and habits of perceiving, evaluating, and analyzing visual information (questioning assumptions and points of view; using evidence to reason; and illustrating the visible) (Sinton & Lund, 2007). A good map tells a story. Maps are essentially telling the story of a community; you can illustrate the story of a place over time, provide portraits of the people who live there, explain conflicts, inspire action, compare data, depict a journey, with having protagonists, struggles, resolutions… many of which are the same evidence you would find in any compelling narrative. More importantly, “A good map teaches you to ask a better question” (Frye, as cited in Kerski, 2016). These questions might include *What if I classified the data differently? What if I added this variable?*
and other “what-if” questions (Kerski, 2016). Today, the ease of using mapping tools and access to online mapping have made maps collaborative and shareable in new ways. Zooming out helps us to connect our local community to the region and the globe. But as web-based maps have become easy to generate and share, the need for critical thinking increases. We must be asking, “Who made that map?” and “What kind of data did they use?” Not only should we be asking inquiry questions about the map, but about the data that goes into the map being used for analysis (Kerski, 2019). Thematic maps are important ways to tell stories, but taking a three-dimensional world and making it into a two-dimensional representation requires decisions on projections, scale, and symbolization. Just like any data visualization, they can be inaccurate or misleading, derivative maps can repeat bad data, and the adage “garbage in, garbage out” applies. How to Lie with Maps author Mark Monmonier (2018) refers to the “cartographic mischief” that can be from “electronic blunders” (p. 2) or be deliberate—either for clarity, or in order to deliberately deceive the viewer. Thus questioning mapmakers’ expertise or motives becomes an important component of developing students’ geospatial literacy.

Mapping is not an objective activity. Blair (2011) reminds us that there are “methodological hazards of reductionism and interpretation in the mapping exercises” (p. 52). As we seek to encourage students to look for patterns, we also risk that they may make generalizations. It is important to spend time helping students to see these risks and understand the pitfalls of such activities and interpretations. In the next chapter, we will discuss the critical place-based pedagogies that have addressed many of these issues.

**Who Is Involved in Creating Maps? Collaboration, Participation, and Beyond**

In addition to analyzing map, let’s turn our focus to those who are making the maps, and how map contributors can add geolocated or georeferenced data using technology. Different individuals or groups can contribute to the construction of maps through drawings, digital illustration, or online GIS maps where our own field-collected data is combined with other available online base maps or data sets to tell our own story of a place. The various ways that these data are collected often depend on who is making the map (whether they be individuals or groups), where
the map is being created (urban, suburban, rural), and in what context (academic course, study abroad, informal learning).

**Mapping Together**
The advances in online mapping, especially online GIS, have made it possible for groups of people to contribute to a common map. Similar to citizen science, *collaborative mapping* is a type of mapping activity that uses “volunteered geographic information” or crowdsourcing to populate a map with geolocated data. Similar to collaborative mapping, *participatory mapping* is a type of mapping activity that uses data from multiple people, though here specifically through contributions of and collaboration with community stakeholders, with the intended goals of empowerment and inclusion of people who might otherwise be simply regarded as the objects of study (Solís, McCusker, Menkiti, Cowan, & Blevins, 2018).

Having students engage in participatory mapping can facilitate the abstract conceptualization of spatial connections. Emmel (2008) describes this interactive group process as a research method used to uncover local knowledge and provide an understanding of the relationships between people, place, and community over time. By generating maps, participants must focus their attention on features of a specific place. This resulting map serves as a tangible reference point for discussing abstract concepts that emerge from concrete descriptions. Using the same process, students move from concrete descriptions to abstract conceptualization as they portray their understandings of the subject being studied.

Participatory mapping often includes social goals. By calling upon multiple groups of stakeholders and allowing volunteers to interact when creating maps together, participatory mapping (PM) can locate assets in a community, involve local citizens in area decision-making about development, and identify endangered animals and trees. “A consistent aspiration of PM has been to engage and empower marginalized groups in society through the use of spatial technologies” (Brown & Kyttä, 2018, p. 1). For example, university “youth mappers” in Uganda are using digital maps to display microfinance locations in the rural areas outside of their city to help local residents find these largely unmarked services. Students in Costa Rica were mapping locations where they spotted trash in order for the municipal government to decide where to place trash cans. Arlington County in Virginia, USA surveyed the public with a map to identify where commuters and residents felt bike routes were most needed.
With the advances in and the ubiquity of mobile devices, public participation in mapping projects has become even easier. No longer does a person need to sit down at a computer to indicate something they saw in their neighborhood—they can do it right away when they spot something in public. The final product is a map co-owned with the community. Using Participatory GIS (PGIS) has a lot of potential, but participants’ possible lack of understanding of the technology and geospatial literacy can be a limitation in using the PGIS approach (Brown & Kyttä, 2018).

There is an assumption that those involved in participatory mapping are the people who are local to that area, but the students can be defined as “outsiders” to an area where they are mapping. In these situations, outside participants may be viewed with distrust; they may encounter language and communication barriers; and the resulting ownership of the data can be unclear (Brown & Kyttä, 2018). “The challenge of building and maintaining trust with participants is important across all PM [participatory mapping] domains, but especially important in indigenous/rural/community mapping because the process is typically sponsored by individuals outside the community of interest” (Brown & Kyttä, p. 6); additional challenges stem from using a broad, one-size-fits-all participatory mapping approach due to the differences in how this type of mapping is used in the global south with indigenous peoples versus urban residents in Western countries, thus underscoring the need to take social context, lived experiences, and perspectives of the community into account.

**Critical Mapping**

Whether it is “critical cartography” (Allen & Queen, 2015), “critical GIScience” (Solís et al., 2018), or the broader fields referred to as the “critical pedagogy of place” (Gruenewald, 2003), this group of pedagogical approaches questions the “assumptions, practices, and outcomes taken for granted in dominant culture and in conventional education” (Gruenewald, 2003, p. 3). That process of challenging assumptions involves two phases, according to Gruenwald. First we need to “identify, recover, and create material spaces and places that teach us how to live well in our total environments (reinhabitation)” and second, we need to “identify and change ways of thinking that injure and exploit other people and places (decolonization)” (Gruenewald, 2003, p. 9). We will be discussing this critical approach to place-based education and mapping throughout this book.
Mapping for Study Abroad
Blair (2011) refines the idea of place-based learning by incorporating urban mapping as an experiential learning pedagogy in study abroad programs. One reason that place-based learning works well for study abroad programs is because students often find themselves in surroundings that are unfamiliar, which prompts a closer examination particularly when what they expect to see or what they consider to be “normal” is missing. Like City as Text, Blair’s approach requires that students use observation skills to create maps that are annotated with personal photographs to anchor the conceptual understanding they gained from course readings in the authentic context of urban neighborhoods. Recognizing the importance of developing a conceptual map to frame their experiences, Blair creates directed excursions that guide students through the streets of Paris, increasing the likelihood that they will successfully master the targeted course outcomes. By completing a series of excursions, which were created to focus on particular aspects of the social and urban fabric of Paris, students gain a much deeper understanding of the course material that is anchored in place.

Mapping Cities, Suburbs, and Rural Areas
Cities become classrooms in place-based learning. Mapping cities provide opportunities to observe and analyze the use of urban space; social relationships; and decision-making, planning, and renewal around growth, change, and diversity. Whether investigating decisions that impact people’s lives, focusing on the distribution of resources, or partnering with the local community, a sense of responsibility, and stewardship can be fostered by these types of activities. One type of mapping that works particularly well in urban areas is food mapping. Participants consider local access to food and identification of possible “food deserts” while considering health, economics, and ecological impacts associated with access to food in an urban area (Wight & Killham, 2014).

Cities have their own landscapes that can be “read,” mapped, and analyzed for their human activity and environmental characteristics. Blair (2011) describes a city as “a collective, social, and living intervention itself shaped by historically contingent economic, political, and cultural forces, which, if one has the appropriate maps, guides and mental dispositions, can indeed help reveal the human rationality and internal logic that determined the city’s shape, life, and meaning” (p. 37). While we often think of urban places as spaces for human activity, these human
activities have an impact on the environment through pollution, energy consumption, etc. Nature exists in cities too—these natural habitats can serve as locations for urban habitat mapping activities, encouraging participants to respect nature in urban contexts (Swayze, 2009).

Suburban mapping can provide a useful comparison point for cities, by asking access questions such as the location of parks, the quality and price of food, or ease of using public transportation. Comparisons between older or newer suburbs can prompt a discussion of social change over time. Examining the drivers of change can lead to discussion of displacement, diversity, homeownership, gentrification, and the identity of place. Many students, and particularly those from small towns or suburbs where they may not have needed to use maps would benefit from some extra instruction on how to make use of maps for navigation purposes (Blair, 2011; Kelly, 2009).

Mapping rural spaces provides wonderful opportunities to incorporate areas such as geology, watershed studies, landforms, and environmental education, but has its own challenges. Huffling, Carlone, and Benavides’ (2017) response to a study by Zimmerman and Weible (2016) explored place-based learning as a tool to help students who, despite learning about the local watershed, were struggling with how to propose collective, action-oriented strategies to address poor water quality. These authors highlight the increasing need for science and environmental educators to re-envision effective pedagogy for rural communities as “economic instability amidst dwindling natural resources brings into sharp relief the tensions between historical, economic, indigenous, cultural, agricultural, recreational, and social uses of land” (Huffling et al., 2017, p. 34).

**Mobile Mapping**

The way that we are able to record geographic information has changed dramatically in a short period of time. Years ago, GIS was confined to desktop applications in which inserting non-numeric data collected in the field, such as images, was challenging. More than ten years ago, when teaching a course that used images collected as data during place-based learning, the students used handheld GPS units to mark waypoints, and took photos with the GPS unit appearing in the foreground, with the historic building or monument in the background (Langran & Alibrandi, 2008). This, of course, led to some fuzzy images (Fig. 1.1).
Back in the computer lab, we would compile the data into spreadsheets by hand, make shapefiles, and several steps later, we would be able to use our networked GIS software to have the geolocated images and other data appear in the onscreen map. Now, with mobile devices such as smartphones and tablets, these data can be directly added to the map from the field in a new era of what we refer to as “mobile mapping.” Mobile devices can stimulate learning by supporting students in the field as they craft their own analysis. In this type of inquiry pedagogy, students identify a location of interest, and capture geotagged voice notes and photos on location. Students can engage in the wonder of asking questions and discovering answers (Dodge, 2011). Mobile devices support the integration of place-based learning back into the classroom, where the instructor can guide student discussions, modeling the process of analysis. The Open University Innovation Report (Ferguson et al., 2019) named place-based learning on its 2019 list of innovating pedagogies, not because it is a new method, but because of the new possibilities provided by mobile technologies to support place-based learning. Both the ubiquity of mobile devices, as well as the comfort level and ease of use among a wider range of people, make this technology easier to integrate.
into instruction. Many people are already using location-aware applications and navigational aids from mobile devices for personal uses and informal learning experiences, so leveraging these geospatial tools makes sense.

**How mobile learning bridges the gap between the classroom and exploring communities**

When we use the term “mobile learning,” we are referring to using mobile technology (such as mobile phones, tablets, and other portable digital devices) for learning anywhere and at any time. This technology makes it possible to use smartphones and tablets outside of the classroom for place-based learning. Across the globe, this form of place-based learning has helped transcend limited infrastructure, bringing internet access to communities that will never have access to fixed-line computer labs and in contrast to a desktop computer, offering an affordable alternative.

Mobile learning makes it possible to use smartphones and tablets outside of the classroom for place-based learning. Estimates put the number of people who own mobile phones at 5 billion, with half of the devices being smartphones (Silver & Cornibert, 2019). While the growth has not necessarily been distributed equally around the globe, the hope is that more people now have access to educational content in places where books may be scarce. The UNESCO Mobile Learning Policy Guidelines (2013) articulate several affordances that mobile devices provide in learning:

- These customizable personal devices facilitate personalized learning and assist learners with disabilities, in part because they are owned by individuals and carried around throughout the day;
- The interactive features of mobile devices and the ability to automate distribution to devices provide immediate feedback and assessment;
- Because people carry the devices with them, they enable anytime, anywhere learning;
- They enable students to listen to lectures or study at home, ensuring the productive use of time spent in classrooms and improve communication and administration;
- They build new communities of learners;
- Location-aware devices move learning to new settings, sometimes using augmented reality, and support situated learning;
- Access to cloud storage enhances seamless learning and bridge formal and informal learning;
It has been successful to minimize educational disruption in conflict and disaster areas and helps maximize cost-efficiency. The ability to use mobile devices on location to conduct mapping activities advances the potential for engaging students and structuring their experience with place-based learning. GIS has for many years depended on desktop computing. We are finally at a time when mobile devices can be used to collect data out in the field, sending information seamlessly to an online map for analysis. Mobile mapping uses a smartphone or tablet to collect data that are tied to a physical location on earth and feeds the information to an online map. These data can include photographs, sounds, a numerical count of physical features, and descriptive attributes.

Mobile learning in formal educational environments requires new pedagogical approaches to leverage the affordances of the technology. Additionally, there are several components that must be in place: “(1) material support, (2) logistical support, (3) instructional support, (4) curriculum support, and (5) community support” (National Research Council, 2006, p. 219). These are important considerations for planning place-based learning.

Informal Learning
Informal learning occurs when we explore national parks or move into a new neighborhood. In our pursuit of developing a skill, and in answering a question or solving a problem, we have a spontaneous and learner-driven experience that often takes advantage of collaboration, bringing together communities of learners who share tips, expertise, and lessons learned. This type of informal learning generally occurs outside of classroom education and training. While it diverges from place-based education in that it lacks instructor-assigned learning objectives and structure, it shares the value placed on experiential learning in authentic settings. As we seek to develop lifelong learners and professionals who are able to transfer classroom knowledge to real-world situations, an inquiry-based and place-based project can borrow from informal learning literature and from what we have learned from observing popular location-based and location-enabled gaming applications, such as Pokémon Go and Wizards Unite. Alternate reality games that are location dependent demonstrate how a story-driven transmedia platform can engage players to interact with place and other players. Being at a particular location triggers an event in the mobile application.
Geocaching was an early location-based gaming activity, using handheld GPS devices. With the advances in augmented reality uses of smartphones, the opportunities for new location-based activities increase. While none have yet reached the popularity of Pokémon Go or longevity of geocaching, there are numerous small projects that allow people to develop location-based mixed reality games and activities on mobile storytelling platforms. For example, LocoMatrix (http://www.locomatrix.com) develops location-based games for schools that allow players to move through “virtual archeology” and use the application to “discover” and “dig” a Roman villa from their school field. Museums and parks, which have already been informal learning sites, are also looking to leverage the ubiquity of GPS-enabled devices such as smartphones.

**The Role of Place in Your Classroom**

When considering whether place-based pedagogy is appropriate, the central question becomes, “How could place-based learning contribute to an understanding or deeper knowledge of the subject?” Steven Semken’s work in the field of geoscience generated a list of five core characteristics of place-based education that have been used to distinguish this approach as unique from others:

1. The content is focused explicitly on the attributes of a place (e.g., geology, climate, ecology, culture, economics, history).
2. The activity acknowledges, and usually explicitly incorporates the diverse meanings that place holds for the instructor, the students, and the community (e.g., locally situated traditional knowledge; toponymy).
3. The activity takes advantage of authentic experiences in that place, or in an environment that strongly evokes the place (e.g., experiential learning, fieldwork, service learning, immersive virtual field environments).
4. The activity promotes, and ideally supports, pro-environmental and culturally sustainable practices and lifeways in the places that are studied.
5. The activity enriches the sense of place held by students and instructors alike (Semken et al., 2017, p. 545).
Table 1.1  Suitability for place-based learning

| Differing roles of place-based inquiry | Sample investigations |
|----------------------------------------|-----------------------|
| **Inquiries best only undertaken when anchored in place.** The lesson is about where a phenomenon occurs or about attributes of place | Impact of climate change:  
- on sea level in coastal areas, and  
- on rainfall in agricultural regions  
- temperature variations by continent  
Access to healthy food in walking distance from public housing complexes  
Distribution of health care services relative to transportation routes  
Comparison of storefront windows featuring multiple languages in two different parts of the city  
Comparative analysis of the plot lines in two novels  
Archive of LatinX murals created by political dissidents |
| **Inquiries that are enhanced by spatial knowledge.** Although spatial tools are used, the location data is not the main focus of these lessons  
**Inquiries not suited to spatial exploration.** Spatial tools are not necessary to accomplish the task at hand | |

Note All of these could have a spatial attribute added but don’t as stated here

These characteristics help us differentiate between the type of topics in which geospatial knowledge is the focus of the intended learning and those that may use geospatial technology as a tool to learn about something else.

In Table 1.1, we offer a few examples of investigations that are well suited to place-based learning as well as investigations that are not:

**Chapter Conclusion: The Case for Place-Based Education**

The calls for place-based education have spanned many decades. Whether these calls are based on privileging the knowledge each student brings to the classroom or on an interest in engaging with the local community, all suggest that place-based pedagogy is an effective strategy. In the chapter that follows, we will take a closer look at why this may be the case, and focusing on critical place-based inquiry.

As we were completing our work on this book, COVID-19 wreaked havoc around the world. Writing about place-based learning during a pandemic underscores both the potential as well as the challenges associated with place-based learning. The spread of the coronavirus highlighted
the many ways that *where* we live and work shapes the differential opportunities and challenges experienced by our students. Proximity to health care services like testing or emergency care and residential density were closely associated with infection rates. And those who could afford to stay home and self-isolate had a lower chance of contracting the virus than those who served on the front line. As teachers and students across the U.S. (and around the world) attended school on virtual platforms, the pandemic offered a striking example of how place matters in our daily lives.

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